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[OFFICIAL NOTICE.]

In the Matter of the Membership List, New England Association of Gas Engineers.

NEW ENGLAND ASSOCIATION OF GAS ENGINEERS,
OFFICE OF SECRETARY,
EAST BOSTON, MASS., November 25, 1906.

To the Members of the New England Association of Gas Engineers:

Any member of the Association whose present address is other than that in the printed list of March, 1906, will confer a favor upon the Secretary by notifying him of said change.

N. W. GIFFORD, Secy.,
No. 26 Central Square, Boston, Mass.

BRIEFLY TOLD.

WOULD LIKE TO GET RID OF ITS "UTILITIES."—The following mention, which comes to us by the courtesy of a correspondent in Cincinnati, O., would seemingly go to show that a public service is not a public trust always. The matter has to do with Bellefontaine, O.: "Bellefontaine, which has long been pointed to as the only city in Ohio owning all of its public utilities—water, gas and electric light plants—now is confronted with the recommendation of the Board of Public Service that the gas works be sold to a private corporation. The gas supplied is of the water gas type, and is distributed to consumers through two meters, on illuminating and fuel accounts' use. The charge for an illuminating service is $1.25 per 1,000, while that sold on fuel account is billed at 75 cents per 1,000. The Board of Public Service declares that gas cannot be manufactured and sold at prices any lower and cause the service to be self-sustaining, and furlher asserts that inasmuch as the public lighting is all done by means of the electric current, the gas plant is no longer any necessity or of use to the public, it should consequently be turned over to private ownership or control. The Council had not, up to the 20th inst., acted on the Board's proposition, but seeks to unload responsibility over the question by suggesting that the right thing to do in the premises would be to submit the matter to a special election of the voters. The gas works it seems is under a bond issue of $25,000, and the Board of Service is of the opinion that the plant and franchises are worth at least $150,000; and, having contemplated with satisfaction the reception of such a sum, goes on to suggest that at least $100,000 out of the $150,000 could be handily and forcefully used in the construction of a sewerage system. While that price for the partial junk heap, dignified in Bellefontaine by the title of gas works, would seem rather high, we have no doubt whatever that in private hands the reconstructed plant could be readily made to pay 5 per cent. there on a valuation of say $200,000. By all means, sell it, and let the tax-paying roll be increased by the addition thereto of a solvent body, and to the further end that the citizens may have the benefit of a better gas service at much lower rates than they have been paying.—R. S. G."

CURRENT COMMENT.—

THE Gas Machinery Company, of Cleveland, O., has been awarded a contract for the placing of an 8-foot set of its standard, double-superheater type of water gas apparatus in the works of the Cedar Rapids (Ia.) Gas Light Company.

THE Gas Bench Construction Company, of St. Louis, Mo., has just completed shipment of 39 cars of its high-grade gas bench settings for the 12 benches of through sixes for the Utah Gas and Coke Company, of Salt Lake City, Utah. This Company has also recently taken orders for benches of nines, for Freeport, Ills.; benches of sixes for Green Bay, Wis.; DeKalb, Ills., and Boise, Idaho.

MR. JOHN MCSWEENEY has been appointed Temporary Receiver of the Wooster (O.) Gas Light Company, which it is hoped will be the prelude to a satisfactory disentangling of the troubles that have virtually put it out of commission.

THE Minneapolis (Minn.) Real Estate Board has passed a resolution recommending that the city invest $25,000 in iron gas lamps and posts, the new equipment to be used in replacing the existing wooden posts now upholding gasoline lamps.

THE New Haven (Conn.) Gas Company is considering the advisability of extending its mains to Milford, and it looks to us a good proposition. The Company has been supplying Woodmont with gas for quite some time, and the town lines of Woodmont and Milford adjoin.

A CORRESPONDENT in Lawrence, Mass., writing under date of the 17th inst., incloses the following: "Mr. Dewey Abell who was promoted some months ago to the position of Master Mechanic of all the steam equipment of the Lawrence (Mass.) Gas and Electric Company, was pleasantly surprised the evening before last as he was about to terminate his work for the day. Men who have worked with him for years gathered at the station and Charles M. Piper, acting as their spokesman,

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SMITHSONIAN DEPOSIT.

presented Mr. Abell with a gold watch chain with Masonic charm attached. The recent creation of the position of Master Mechanic was preceded by several changes. William H. Wolverkamp, Superintendent of the electrical department, resigned after being with the Company for a term of years, and Isaac Osgood, a North Andover young man, late of the General Electrical Company, of Lynn, was engaged to fill the vacancy. Mr. Osgood resigned to go elsewhere and in considering the matter the management decided to create a new position of Master Mechanic of steam eqnipment, the care of the electrical equipment to be left to the foremen of the stations. Mr. Abell has been with the Company for fully 20 years, half of which time he has held an engineer's first-class license granted by the State Board. Naturally he was thought of for the new position, the promotion being a deserving one in recognition of the many years of efficient service he has rendered the Company late in the capacity of engineer at the Edison power station on Common street. Rejoicing over his promotion his fellow workmen took occasion to make manifest their goodwill by presenting him with a chain and charm, the latter being appropriate in view of the fact that Mr. Abell has but recently become a member of the Masonic fraternity. Not suspecting anything of the nature, Mr. Abell was greatly susprised and in a few words of acceptance of the gift he made expression of how deeply the gift touched and the kindly feeling which prompted it. Following the little ceremony cigars were lighted and some time was spent in conversation."

MR. CHARLES E. RUGER, who was appointed last June as Receiver of the Muncie (Ind.) Gas Light and Fuel Company, has filed in the proper court a statement of the expenditures and receipts of the concern since he accepted the management thereof. He seems to have been right successful in his custodianship, for he received $24,500 and paid out $15,000.

THE Directors of the Waynesboro (Pa.) Gas Company have declared a dividend of 5 per cent., the first return the shareholders have received since the Company was organized. Good for the Middlekauff-Baehr-Schaibley combination.

THE Board of Gas and Electric Light Commissioners of Massachusetts has ordered that the Pittsfield Coal Gas Company may increase its capital stock in the sum of $50,000, at the upset price of $135 per share. Under the wording of the order the proceeds are to be applied to the payment and cancellation of an issued account of the promissory note of the Company.

A CORRESPONDENT in North Brookfield, Mass., forwards the following: "Representative meu from Spencer, Leicester, Brookfield, North and West Brookfield, Warren, Palmer and Monson, Mass., were present at a dinner given to President Alfred Clark, of the Worcester County Gas Company, by the Trustees of the Massachusetts Lighting Companies, in recognition of the completion of the extension of the system to Palmer. A most elaborate course dinner was served at the Bay State Hotel, Worcester, and when the cigars were lighted at the conclusion of the spread, President Childs, of the Massachusetts Lighting Companies, called to order, and introduced President Clark, who was received with applause. He responded with becoming modesty, giving full credit to his subordinates who had helped so materially in the success of the project which had been pronounced by gas experts as impossible of accomplishment. He mentioned especially Mr. F. A. Barr, of the Spencer Gas Company, who makes the gas, and Mr. Charles Ennis, who has had full charge of the actual work of construction and equipment. He called especial attention to the fact that every promise that had been made by the Company had been fully performed, and that people all along the line were well satisfied with the quality of the gas furnished. There has been no break in the service since it was established. Senator Prouty, of Spencer, paid his compliments to Mr. Clark, and Mr. Johnson, of the State Highway Commission, bore testimony to the good condition in which the Company had left the highways wherever they had used them in laying pipes. Mr. Jenkins, of the State Gas Commission, stated that the quality of the gas furnished was 21-candle power, where the standard is only 16. Alexander Porter, Jr., of the brokerage firm of Garrett & Porter, Boston, stated that he considered the stock in public service corporations in Massachusetts was very desirable for investment, and that he considered this Company as first-class. James J. Hill, of Warren, Senator Norcross, of Monson, Representative Hobson, of Palmer, Selectman Mellen, of Brookfield, Horace J. Lawrence, of North Brookfield, and W. J. Heffernan, of Spencer, were the other speakers. The universal expression was that the Company had 'made good' its promises, and President Clark was to be congratulated on his success in the face of so many obstacles."

[AS FURNISHED BY THE OFFICIAL STENOGRAPHER.—Continued from page 1072.]

PROCEEDINGS, FIRST ANNUAL MEETING, THE AMERICAN GAS INSTITUTE.

HELD IN THE AUDITORIUM HOTEL, CHICAGO, ILLS., OCTOBER 17, 18 AND 19, 1906.

FIRST DAY—AFTERNOON SESSION.

REPORT OF THE BOARD OF REVISION.[1]

THE MECHANICAL ASPECT OF GAS DISTRIBUTION.

Computing Gas Leakage.—I have never seen any attempt to compute the loss of gas per mile of service. Leakage is often affected more by the station meter than by the efficiency of the street men. It is generally conceded good practice if leakage does not exceed 100,000 cubic feet of gas per year per mile of main reduced to a 3-inch basis. In reducing mains to a common basis for estimating leakage, the ratio is directly as the circumference of the pipe, because the area for probable leakage will be the outside of the pipe and the joint surface. As the circumference and the diameter are in the same ratio it is easier to use the diameter for figuring; for instance, a 6-inch pipe will have twice the leakage area that a 3-inch has and one half as much as a 12-inch.

Example, for relative leakage:

100 feet 6-inch pipe equals 200 feet 3-inch.
100 " 12 " " " 400 " 3 "

Almost all gas companies now make periodical tests of their mains and services to determine leakage.

Testing by Districts.—If a thorough testing and overhauling of the distribution system is to be made, the city or town should be divided up into districts and each district isolated, if possible, and gas passed into each section thus isolated through a meter, the consumers' meters in such section being all shut off. In this case the consumers must have due notice of both the shutting off and turning on again; and the gas should not be turned on without the consumers' knowledge or access to the fixtures. If the registration of the testing meter shows an abnormal leakage, barring should be resorted to to locate the leaks. In a section where it is impracticable to shut off the consumers so that the section may be tested by allowing what gas leaks to pass through a test meter, and if the leakage is known to be great, it will pay to bar over all of the mains.

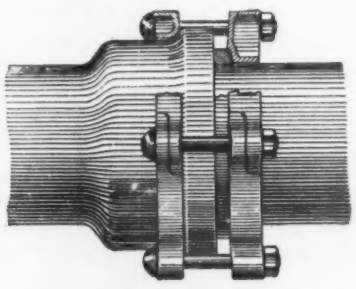
Methods of Isolating Sections.—There are several ways of isolating a section: If valves are already in place and are tight, these valves may be shut off; if the valves are not tight, and are double gate valves, the valve may be washed clean by flushing with water through a ⅜-inch hole drilled in the side of the valve between the gates. If this does not make them tight the valves should be closed and a street ell screwed into the ⅜-inch hole. From this street ell a pipe is extended upward 2 or 3 feet and the space in the valve between the gates kept filled with water or oil. Another plan which may be used when valves are not available is to tap a 2-inch hole in the main and insert 2 bags into the pipe, inflating them equally and making them take position on either side of the bag hole. A 2-inch nipple some 2 or 3 inches long is slid down over the tubes of the bags and screwed into the hole. Water is then poured into this nipple and fills the space between the bags to supplement their own tightness. By keeping the water filled up into the nipple, a slight head is maintained and a most satisfactory degree of tightness is secured. If the mains on which the bags are used contain deposits of naphthaline, a wise precaution is to wash it out by injecting naphtha or wood alcohol through the bag hole, followed by a thorough washing with warm water. Should the water leak from between the bags very rapidly, a heavy oil may be used instead of water or the water may be mixed with oatmeal. Another method of sealing is to tap a very large hole and fill the pipe with a mixture of fireclay and cement, half-and-half. This mixture will not set hard and can be removed with a spoon after the test has been completed. In this case, as well as in the case of a smaller main where a large hole is tapped for the insertion of the bag, a sleeve should be put around the main at this point to strengthen it when the test is completed.

Barring for Leaks.—In barring or sounding for leaks it is well to locate the position of the main as near as possible and drive the bar down at the side of the main and to the depth of about its bottom. If the joints can be located, so much the better, and the bars should be driven near the joints. If one joint is uncovered the location of the other joints may be measured off by using that joint as a basis. Dif-

1. Continued from page 1072.

ferent methods are used for barring. Some gas companies use a hexagon steel bar ⅞ inch in diameter and about 6 feet long, pointed at one end. This bar is driven into the ground by its own weight, the man using it lifting it up and driving it into the ground with both hands, somewhat in the manner as he would a spear. The bar will usually sink from 2 to 6 inches at a stroke. After the first stroke the bar is worked around slightly, then lifted and dropped into the hole again. This operation is repeated until the required depth has been reached. This method works particularly well in soft ground. In ground which is harder, a bar about 5 feet long and 1¼-inch in diameter is used. This is driven into the ground by using a 6 or 8-pound, long-handled driving hammer. If the ground is very hard a shorter bar, of larger diameter, say 3 feet long, may be used to start the hole. In sounding care should be taken, especially where the sledge or hammer is used, that the bar is not driven through the main. If the bar sticks tightly it may be pulled by means of a lever and chain. The chain wrapped around the bar and then hooked up over the end of the level and by placing a fulcrum under the lever and then bearing down on the long end, the chain will tighten and the bar may be pulled. After the hole has reached the required depth the sounders should smell to determine if gas is escaping. It should be tested again in about 10 minutes. If a leak exists it will be evident by this time. Stale gas will not last and may be detected by the sourness of the smell. Should 3 or 4 adjacent holes smell, allow them to remain open for some time and dig up the one which finally shows the largest amount of gas escaping. If there is no leak detected, the hole may be closed up. In closing the bar holes in pavement, the earth should be tamped in to within 6 or 8 inches of the top and the hole then poured full of a grout made of neat cement.

Repairing Leaky Cast Iron Mains.—When the leaky main or service has been uncovered, the cause of the leak may be ascertained and a remedy should be applied which would be a permanent one. In case it is just simply a lead joint which leaks it may be re-caulked. If, however, examination would convince the foreman that the leaky joint is caused by vibration of the pipe caused by heavy traffic on the street, the joint must not only be re-caulked but, in order to be a permanent job, a leak clamp as shown herewith should be placed on the joint. The rubber on these clamps allows for a certain amount of vibration. The same method should be pursued in case of a leaky cement joint with the exception that, in the case of a cement joint, the first string of yarn should be entirely cut out and the joint should be made all over. A leak which is too small to light may sometimes be detected by the condition of the soil around the joint, in such cases it being usually blue or blackish in color. The men should be cautioned not to use a light when looking for leaks, but to depend on the sense of smell or the effect of soap and water. The flash from a light may travel for some distance and, acting as a fuse to a body of mixed gas and air, cause an explosion, resulting in great damage. If a main is broken the escape of gas may be stopped temporarily by putting either clay or soap into the crack. If the main must be left for some time without being permanently repaired, a temporary repair may be made by wrapping canvas or muslin saturated with white or red lead around the main. If the break runs around the pipe and does not extend longitudinally, the repair may be made by a split sleeve. If the crack extends for some length along the main, the piece must be cut out and a new piece inserted. When a split sleeve is to be used, all dirt and rust must be scraped off the pipe for a distance of a foot on each side of the break, and if the pipe has settled it must be brought back to the proper grade and alignment. A strip of unbleached muslin, wide enough to cover the break with a margin of 3 or 4 inches on each side, and long enough to completely wind around the pipe several times, is smeared with a putty made of white lead or equal parts of white and red lead and linseed oil, and wrapped tightly around the pipe over the break. This serves to entirely prevent the escape of gas while the job is being completed. A split sleeve, that is, a sleeve made in 2 pieces, each of them similar in size and shape to the pieces that would be obtained by splitting a solid sleeve along a plane containing both its axis and diameter, and provided with longitudinal flanges, by which they can be bolted together, is then applied so as to cover the pipe at the break and for at least 3 or 4 inches on each side of it. The joint between the split sleeve and the pipe can be satisfactorily made in various ways.



One method is to plaster the inside of each half of the sleeve with a layer of Portland cement, mixed neat, of sufficient thickness to insure the complete filling of the joint and the compacting of the cement without allowing the flanges to come face-to-face when the 2 parts are put over the pipe and drawn together by means of the bolts. Enough cement should squeeze out through the spaces between the flanges to fill them thoroughly; but if this does not occur the unfilled places can be pointed up, so that, when the job is completed and the cement has set, the 2 halves of the sleeve are joined together with a gas tight joint by the cement between the flanges.

Another method is to make the joints between the flanges gas tight by using strips of millboard that have been soaked in hot water until they have become soft enough to be squeezed into all the roughnesses of the faces of the flanges when the two halves of the sleeve are put in place, surrounding the pipe and bolted together. The joint between the sleeve and the pipe is then made exactly as would be done in the case of a solid sleeve, using either lead or cement. The latter is preferable unless the conditions are very much against its use, since making lead joints involves the carrying to every repair job of a furnace, lead pot and ladle. Drawings of 2 styles of split sleeves, showing their dimensions and the number of bolts used, can be found in the Proceedings of the American Gas Light Association, Vol. 15, p. 68, and p. 14 of the Appendix, and also in the AMERICAN GAS LIGHT JOURNAL, Vol. 69, p. 712, and "Progressive Age," Vol. 16, p. 529.

When the break runs too far along the pipe to be properly covered by a split sleeve, it is necessary to cut out the damaged portion of the pipe, making the cuts at least 3 inches to 4 inches beyond the furthest point reached by the crack at each end and replace it by a new piece. To do this the main must be uncovered for a sufficient distance to enable bag holes of the proper size to be drilled and tapped far enough apart not to interfere with the work of putting in the new piece. The gas having been shut off by means of the bags inserted in these holes, the pipe is cut at the proper points, either with a pipe cutter or by the use of a diamond point and cold chisel, and a new piece of pipe of the required length cut and put in, a solid sleeve being used to make the joint where the 2 spigot ends come together. Before sliding the sleeve into place, the opening between the 2 spigot ends is covered by wrapping the pipe with unbleached muslin prepared and used as is done in connection with the repair by means of a split sleeve. Either lead or cement joints can be made in the bell and in the sleeve, but the use of cement is generally preferable, for the reasons stated above.—(A. G. L. A.)

Should the leak be simply from a sand hole in the main, or because a bar has been driven through it, the hole may be tapped and a plug inserted.

Determining Cause of Corrosion.—If the main should show signs of pitting or of corrosion, it would indicate that either the main is laid in ground which is filled with ashes or some other material, the acid of which would affect the pipe, or else it would indicate that the main is subject to the action of electrolysis. If the pitting is caused by electrolysis, the metal will be found very soft around the pit marks, resembling carbon, and capable of being cut with either a knife or chisel. There is also a difference in the oxide.

The difference between the oxide of iron due to cinders, ashes, etc., and that due to electrolysis, can always be determined by drawing a piece of oxide across the unglazed edge of a piece of broken porcelain or across a "streak" plate used by mineralogists.

The oxide from electrolysis is always .75 oxide—the magnetic oxide (Fe_3O_4)—and leaves a black mark or streak. The oxide due to rust, cinders, etc., is always .66 oxide (Fe_2O_3) and leaves a red streak. The .75 rust never occurs in the street except through electrolysis.—(O. Q. B., No. 603.—J. M. Morehead.)

But the surest way of determining is by taking electric measurements with a voltmeter. In case it is determined that the leakage is caused by electrolysis, an expert should be called into consultation to determine the best way of minimizing the trouble.

Broken Service Connections.—Oftentimes the main will be found broken where the service connection is made to the main, in which case it is advisable to put on a split sleeve and tap the service connection through the sleeve, connecting up the service again by means of a running thread. The service should be carefully blocked. If the service is broken off at the main or should be pulled out of the tap hole, the hole should be drilled and tapped a larger size and the service reconnected. In doing this work the workmen should be very careful that the service and main are properly blocked before leaving. In case the leak is from a rusty service the service pipe would need to be renewed, and if the soil shows signs of the presence of ashes or other cor-

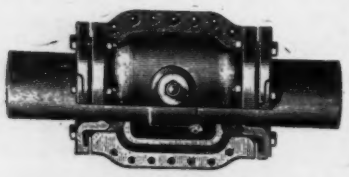
roding material, the service should be protected by an application of one of the coatings enumerated under "Low Pressure Main Laying."

Thawing Out Frozen Ground.—Broken mains usually occur in the winter, and the ground may be thawed out by means of coke fire, or if it is not advisable to use a fire, by digging out the ground to a depth of 3 or 4 inches, throwing a barrel of unslacked lime into this hole, pouring some water on the lime and covering with some pieces of old carpet; burlap or even dirt may be used. The heat from the slack of the lime will thaw out the ground to the depth of a foot or more. It is well to do this in the evening when leaving the job and allow the lime to stand in the hole all night.

Putting Out a Fire.—If the main is broken and the escaping gas has caught fire by some means, the fire may be extinguished by throwing a quantity of flour upon it. The larger the blaze the greater the quantity of flour needed.

Vent Pipes for Leaks.—All gas companies should make a practice of overhauling the main line on any street which is about to be paved, and put it in first-class condition, recaulking or repairing any leaks which may be found and replacing any defective pieces of main. In this connection it has been suggested that when this work is done it is well to mark on the curb or at least make a record of the location of joints, and in order to facilitate the location of any future leakage, to run a 3¼ vent pipe from the joint to the curb and then up to the surface of the ground where it is capped. The idea is that should a leak develop on the street, by taking off the cap the leak can be readily located, in which case, if the leak cannot be repaired at once, the vent pipe may be so arranged that any escape of gas will come to the open air through it and that the gas will not permeate the ground and kill adjacent vegetation.

The locating of leaks in wrought iron main lines is not essentially different than that described for the location of leaks in cast iron mains. If the leak is a split in the pipe or a defective weld, it is usually repaired by means of a split sleeve. If it is simply a sand spot in the weld it can be drilled and tapped out and a plug inserted. If the bad spot is too large to be drilled out and tapped successfully, the leak may be closed by means of a blank saddle clamped tightly over it.



Heavy Split Sleeve.

Leaks at joints where the pipe is screwed into the couplings or fittings, may be repaired by means of collar leak clamps. For description of these, see article under "Natural Gas Section."

Complaints of Poor Pressure.—Complaints of poor pressure should be investigated at once. The poor pressure may be either local—that is, confined to one consumer, or it may cover a district. First determine, either by inquiry from the consumer, or by investigation, the nature and the location of the trouble. If it is general—that is, if it occurs over all the house—the cause must be in the service, meter, or the riser between the meter and the first branch pipe. If it is confined to 1 floor or 1 room, it is only necessary to examine the portion of the system which supplies that floor or room. Poorness of light, due to a uniform low pressure without fluctuation, indicates an obstruction formed by solid matter. A quick, sharp, jumping flame shows an accumulation of liquid at some point, and a slow rising and falling in the size of the flame, which takes place in comparative long and regular intervals, is a sign that the meter is overloaded or else sticks at some point. If the supply is poor in one fixture and good in others the trouble is not due to poor pressure, but is caused by stoppage in the fixture which can be readily removed. If poor supply in Welsbach lights only, it is usually caused by poor combustion. That is, an improper amount of either air or gas, and the burners should be adjusted in the period of greatest consumption. Complaint of poor supply to gas appliances is often caused by poor combustion due to the improper size of orifice, which may be either too small or too large, or the trouble may be caused by an accumulation of dirt and dust in the air chamber. —(Frank Hellen, '04; Q. B., No. 114.)

If the trouble does not seem to be in the fixtures, to localize the trouble it is advisable that at the hour of greatest demand a U-pressure gauge be placed on an adjacent lamp post and a reading be taken to see if the pressure on the gauge is normal. If the pressure on the main is normal the gauge is then placed on the service before the inlet to the meter. If, when gas is being used under the usual conditions, the gauge shows a marked drop in pressure between the main and the end of the service at the meter, then the trouble is in the service. The obstruction in the service may be caused by an accumulation of water in the service. This can be readily detected by the intermittent flow of gas as well as by the gurgling noise made by the gas as it bubbles in the water. If water is found, blow it out with a force pump. If the trouble is in the winter time, it may be that the service is obstructed by frost; in that case it can be cleaned by either pouring alcohol into the service or forcing alcohol vapor through the service by means of the force pump.

In using alcohol, gasoline or other volatile or inflammable liquids for cleaning out stoppages in services or mains, great care should be taken that a light does not come in contact either with the liquid or its vapor. It is best to use a safety lamp in work of this character whenever it is necessary to use a light at all.

Experiments made in Milwaukee laboratories, on a sample of commercial acetone and a sample of wood alcohol on the market, showed the alcohol to be more effective in melting ice than the acetone by the ratio of 1.32 to 1.00, volume for volume. The solvent power for naphthaline at 32° F. was in favor of the acetone by 5.07 to 1.00.—(Harrop, '04; Q. B., No. 126.)

Our experience demonstrates that grain alcohol is superior to wood alcohol as a solvent for frost, and on account of the smaller quantity needed for the work is as cheap.—(Blowers, '04; Q. B., No. 131.) This seems to indicate that the wood alcohol on which the conclusion is based was considerably diluted with water. Every purchase should be tested.

Should the trouble be caused by naphthaline, it may be removed by the application of hot water, followed by gasoline and the use of the force pump. If the service is rusted and the stoppage is due to that, a long wire and a force pump may be used for cleaning. If trouble is not located in service, disconnect outlet of the meter, and if trouble is found to exist in the meter, remove it and install another in its place. If the trouble is caused by water in the meter it can be emptied and the meter replaced. In this case the workmen should be careful to empty the meter in some place where the smell will not be offensive. If the trouble is not located in either service or meter, it is usually found in the riser, and if it is not caused by frost, is generally due to an accumulation of rust in one of the elbows which can be readily removed by the use of a wire and force pump. Some do not advocate the use of the U-gauge but prefer after reaching the district affected to go from door to door until it is found where the complaint begins. Light all of the burners and go to the house next on each side and do the same thing and note the condition of the lights. The use of the U-gauge is not recommended in running down an order of this character, owing to the fact that an employee is often misled by the fact that, if it is a resident section, he would have normal pressure registered even if there were only an opening in the main large enough to pass a lead pencil.—(Ganser, '04; Q. B., No. 110.)

This would not occur, however, if the tests were made at the time of greatest consumption. If the first test should show that the main does not carry the normal pressure, then a series of tests should be made throughout the locality and the drop between testing points carefully noted. These tests should be made, if possible, during the period of greatest demand and the readings on the gauges should be taken all about the same time. Calculations of the natural drop due to friction between these test points should be made. Any discrepancy would denote some stoppage. Partial closure of valves, unpumped drips, flooding of mains, naphthaline, etc.—(Latta, '04; Q. B., No. 110.)

The stoppage will be located between the 2 points showing the largest difference in pressure. Should a series of tests not show any marked difference of pressure between 2 adjacent points, but the pressure drop gradually, it is quite possible that the main is not large enough. Should the trouble be caused by a deposit of naphthaline, it may be cleaned out by the application of either steam, hot water, tar oils or gasoline, as circumstance may indicate best.

Complaints of Leaks in House Piping.—Leaks in house piping and fixtures may not be large enough to make any difference on the consumer's bills and yet be a source of annoyance to him. As before stated, leaks may be prevented by specifying that the best quality of pipe, preferably strictly wrought iron, be used, and the heaviest and best malleable fittings, and thoroughly testing the house piping when the work is completed and before the meter is set. The test should be made with an air pump and mercury test gauge.—(Kirk, Leach, MacMillan, Franklin, '03; Q. B., No. 125; Cooper, Shattuck, Whysall, Bates, '03; Q. B., No. 135.)

If a leak is reported to the office by a consumer and a man is sent out to locate and remedy it, the following instructions may be given him: Should a leak be in the cellar or be very strong in the house, the gas should be shut off and the windows thrown open to let the accumulated gas escape. The only light used should be a safety lamp Never search for a leak with a light or match. Use the sense of smell.

it is safer and more reliable for the following reasons: First, fire may cause explosion; second, flame may discolor any article it approaches; third, odor from flame may prevent later detection of a very small leak by the sense of smell; fourth, a small leak when lighted burns with a blue flame, which is almost invisible, yet may melt solder joints and ignite other material; fifth, a small quantity of gas mixed with air forms a dangerous explosive, hence fire in a leak near concealed piping, or where gas has accumulated, is particularly hazardous. Never permit fire or light in any form in an apartment where gas is escaping. A current of combustible gas mixed with air will drift some distance from its source and will, when lighted, fire back like a fuse to the main volume, causing explosion.

Always, before repairing or disconnecting any gas pipe or apparatus beyond service or meter cock, take the following precautions:

(a) Notify occupants of all premises supplied, that gas will be temporarily shut off and that all burners in use, including pilot lights, should be at once closed.

(b) Shut off gas completely at cock or valve directly supplying pipe to be disconnected.

(c) When work is finished, notify the occupants of all premises supplied that gas will be turned on and to assure themselves that all burners remain closed.

(d) Turn on gas at cock or valve which you closed before beginning work.

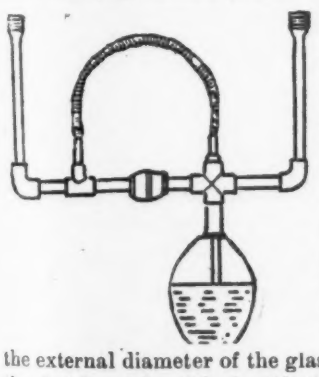
(e) To determine whether leak exists beyond the meter, assure yourself that all burners, including pilot lights supplied by meters, are closed. Turn on gas at meter cock. Watch small test hand on meter dial. If hand moves, leak exists. Locate and close leak. Continue this until hand remains absolutely stationary during full 5 minutes.

(f) To locate leak, use, first, sense of smell, particularly at pipe joints and fittings. If still doubtful of leak apply carefully at each joint and fitting strong suds and watch for expanding bubbles, indicating leak.

(g) If you cannot locate or cannot close the existing leak, shut off gas completely at the cock or valve directly supplying such leaking pipe or apparatus.

(h) Disconnect one of the side brackets and pour into pipe a small amount of ether. Connect air pump and raise pressure to 5 pounds. When the fumes of ether will have spread through the whole system of house piping, the location of the leak may be readily detected by the sense of smell.—(F. Hellen, '04; Q. B., No. 109.)

If the gas pressure is to be used for testing leaks, some of which may be so small as not to be detected by watching the meter test dial, the following method (a modification of the original Chollar test by Ferrier) may be used. The bulb shown is a glass oil cup of the inverted pattern, and is readily obtained from dealers in steam fittings. As these cups are furnished with pipe threads, the ease with which such a device is rigged up is evident. The connection between the cross and the glass tube is made by means of a rubber stopper, and to obtain a tight joint the threads of that branch of the cross are bored out. The opening of the oil cup must be made at least ¼ inch larger than the external diameter of the glass tube. The upright nipples shown in the sketch are furnished with the standard male threads of a meter; a set of these nipples corresponding to different sizes of meters should be provided. In making the test, all that is necessary is to substitute the tester for the meter.



Inside Piping.—Almost all architects' specifications now call for the piping in a building to be done according to the rules of the gas company and the gas company usually adopts such rules as will insure that the size of the pipe used will be of ample capacity to carry the amount of gas it is expected will be needed with a differential pressure not exceeding ½ inch of water. They also specify that the work shall be done in such a manner as to insure as far possible the safety of the occupants of the building. The following rules for size of pipe for inside piping were adopted by the American Gas Light Association in 1898:

Diameter, Inches	Length, Feet.	Gas per Hour, Cubic Feet.
⅜	20	11
½	30	22
¾	50	60
1	70	127
1¼	100	222
1½	150	349
2	200	718
2½	300	1,253
3	450	1,977
4	600	4,059

No greater length of pipe should be used than is given in the table; e. g., the maximum length of 1-inch pipe allowable under any circumstances is 70 feet, and it should not be expected to carry over 127 cubic feet of gas per hour.

One of the natural gas companies where gas is largely used for fuel, has adopted the following rules governing the size of the pipe and the method of installation:

Gas for Light.—No pipe less than ⅜ inch.

Size of Pipe, Inches.	Greatest Length Allowed, Feet.	Greatest No. 3/16-inch Openings Allowed.
⅜	12	2
½	30	3
¾	60	10
1	70	15
1¼	100	30
1½	150	60
2	200	100

Gas for Fuel.—No pipe less than ¼-inch.

Size of Pipe.	Greatest Length Allowed.	Greatest No. 1/8-inch Openings.	Instead of 1/16-inch Openings there may be 1/8 and 5/8 or 3/4.		
¼	15	1	1	..	..
¾	50	2	1	1	1
1	70	4	2	1	2
1¼	100	8	4	2	4
1½	150	15	6	4	7
2	200	33	14	8	15

All new piping must be tested with a mercury gauge and shall be made tight at a pressure of not less than 4 pounds or 8 inches of mercury. No spring gauges will be allowed. The gas company must be notified of the completion of any job so that it may inspect the same, should it deem it necessary. The riser pipe in any building shall not be less than ¾ inch and must go in an inside partition wall and out of reach of frost, and must not project more than 2 inches below the cellar joist. No traps in the riser will be allowed. Drop or bracket outlets must be securely fastened. Split pipes must not be cemented, but the pipe must be taken out and a perfect piece substituted. No cast iron fittings will be allowed, only the best malleable iron fittings galvanized. In case more than one consumer wishes to use gas in a building a separate riser must be run for each consumer. In no case will a meter be set where the gas passing through that meter must be deducted from another meter through which it has previously passed. Piping shall be so arranged that the meter can be placed in a position easy of access and exposed to neither dampness nor extreme heat or cold. The meter should be placed as near where the service enters the building as possible. Suspended pipe must be securely fastened. No strings, rope or wire should be used.

In addition to the above the following notes may be of interest:

For this work it is advisable to use the best quality of wrought iron pipe obtainable, as this insures that the threads will be cut without stripping and there will be less liability of split pipe. The fittings used are preferably malleable iron, beaded, and the best practice is to use galvanized fittings since the galvanizing has a tendency to fill up whatever sand holes or porous places there might have been in the original casting. For the dope on the threads any one of the various compositions given under "Wrought Iron Main Laying" may be used on male thread only.

Care should be especially taken that all openings are securely fastened. There is now on the market a malleable iron drop fitting having lugs or ears projecting from the side for the purpose of fastening. The use of this fitting makes it easier to fasten the drop and would also prevent the liability of the drop being unscrewed when the fixtures are taken off. No unions should be allowed to be used, as it is almost impossible to make the work come so exact that the 2 faces of the union will press against each other, making a tight joint without the use of a washer, and unions with which the joint is made by a washer are much more liable to become leaky than long screws. The long screws are cheap and make a joint that is tight or as permanently tight as any other joint.

Testing Inside Piping.—After the piping has been completed it should be tested to see that it is perfectly tight. It is customary for the plumber to first ascertain if his job is tight, and, after making sure that this is the case, to ask the gas company's inspector to make the final examina-

tion. The plumber should see that all openings are carefully closed with caps and that the foot of the riser line is stopped. Then at any convenient sidelight attach an ordinary gasfitter's pump and mercury gauge. This mercury gauge should have a column of 15 to 20 inches in length. Air is forced into the piping by means of the pump until the mercury column has been forced up about 10 inches high in the gauge, when the pump is shut off. If the mercury falls there is a leak in the pipe; if it remains stationary the pipe is tight. It is customary to require that the mercury remain stationary for from 15 minutes to ½ hour. If the mercury falls rapidly it will indicate there is quite a leak and this leak will be heard to blow. If the leak is caused by a piece of split pipe or split fitting the pipe or fitting should be removed and a new piece substituted. Gasfitter's cement should not be used for repairing leaks. If the leak cannot be heard blowing, ether may be put into the hose of the air pump and the pumping of the air into the pipes will carry the ether into the pipe. The odor of the ether escaping will indicate where the leak may be found in the pipe and it may be definitely located by means of a strong soap water applied with a brush or sponge. The liquid is rubbed over suspected joints or fittings and air bubbles are blown by the escaping air. In very large work it is advisable to prove 1 floor or 1 section at a time and when all are done connect them with the riser and prove as a whole. If the pipe to be tested has been previously used for gas and you have to test for leaks, it will be necessary to take off the meter and cap the bottom of the riser; also to take off the gas fixtures and cap the outlets carefully, as it is impossible to test pipe with the fixtures on and find it tight. The ground joints in the stopcocks of the fixtures almost always leak when the pressure is put on them. Sometimes plumbers, when they have a small leak and are unable to find it, or if it is concealed in a partition where it is impossible to get at it to repair, will fill up the house piping with water containing salt or ammonia solution, hoping by this means to rust the leak tight. They are almost always successful in doing this, but the practice should be condemned, for after the water has been drawn out of the pipe the ammonia and salt still continue to rust the pipe and in time this rust will collect in some one place and stop up the system.

Some gas companies require that the gasfitter file at the gas office a sketch or plan showing the size pipes run and the length of each piece. This plan is filed previous to inspection. The company's inspector checks up the sizes to see that they comply with the rule. He afterwards examines the piping in the house before it is concealed, and if the piping is according to the rules of the company he gives a certificate to the effect that he has inspected and found it to be tight and to comply with the company's specifications. It is stated, however, in the certificate that the issuing thereof does not insure its future soundness. At the time of the setting of the meter, or at the time when the gas is turned on, a second inspection is made, this time of both the pipe and the fixtures, and in case these are found tight the gas is turned on.

There should be added as an appendix:

"Instructions for Gas Distribution Employees;" by J. M. Robb, O. G. L. A., 1906.

"Report of Committee on Electrolysis;" A. G. L. A., 1906.

"Report of Committee on Standard Sizes of Cast Iron Pipe and Specials;" A. G. L. A., 1898. 1905.

"First Aid for Persons Overcome by Gas;" United Gas Improvement Company, 1905.

Discussion.

The President—Having listened to this Report of the Board of Revision, I think the book speaks for itself. This, in my judgment, is a right beginning, and if the work is continued, it will give a text book of great use to the young men of our profession. What is your pleasure?

Dr. Harrop—Mr. Chairman, may I ask you to ask Mr. Stone if he will run briefly through the part of this report covering the mechanical side of distribution? Mr. Stone had charge of that part of the work. I think if he does that it will give the members a much clearer idea of the ground covered.

The President—Will Mr. Stone please come forward?

Mr. Stone—Mr. Chairman, it was impossible to read this. As you see, it is quite a book. It would be a physical impossibility for a man to read it within the time which we have to give to it.

The President—Dr. Harrop suggested, Mr. Stone, that you simply go through the pamphlet, and if there was anything there that would be of interest to bring out some new thoughts it would be a good plan to call it to the attention of the members.

Mr. Stone—Well, Mr. President, I might say in regard to the report that it is intended for the use of men who know little or nothing about the laying of pipe or putting in the distributing system of a gas plant. One of the hardest things we had to decide was how much to put in and how much to leave out; that is, how much detail should go into the book. Of course, some things are here that you and I would say are useless to us because we know them; but, on the other hand, there are lots of men in the business who do not know many things that are apparently simple to you or to me.

Mr. Stone having given a synopsis of the subject covered by the report, said: In addition to this, if this was to be a complete book on gas distribution there should be added instructions for gas distribution employees, such as that contained in the volume gotten out by Mr. Robb. Also, a report of the Committee on Electrolysis and a report of the Committee on Standard Sizes of Cast Iron Pipe, such as that made to the American Gas Light Association in 1898 and 1905. Also, the booklet issued by the United Gas Improvement Company, in 1905, giving instructions on first aid for persons overcome by gas. It was intended to treat the mechanical part of the business, especially that on distribution, as thoroughly as we could. Lots of things were left out, and probably some of the things put in might have been left out. There are some things on which we might not agree. We may have differing opinions in regard to what is the best practice, and we simply did the best we could in the time we had. [Applause.]

Dr. Harrop—I would like to say a word further on this publication. As you know, this was originally an undertaking of the Ohio Gas Light Association, and it was brought into the Institute as a legacy from the Ohio. We made up our minds to publish the section on "Distribution of Gas" because that was in better shape than any of the others, and because we felt we could complete it in time and make a better piece of work of it than of any of the other sections. I do not think it will be taken amiss if I ask the Institute to express its opinion of this work as it has been reported upon to-day, for it depends entirely on the position that the Institute takes with regard to this work whether it goes on or not. The pamphlet before you was published at the expense of Mr. Stone and myself. The total cost was $176, making it a matter of somewhat less than $90 apiece, and so far as that goes, we do not feel badly about it; but I think, to speak plainly, it must be evident that unless the Institute takes hold of the revision work, and either entrusts it to us or gives us the authority to go ahead with it, and gives us ample financial assistance, it will be very disappointing to us, who have worked on the matter so far and have put so much time and effort into it. I, therefore, ask the American Gas Institute to express its opinion one way or the other on this work as represented by the report of the Board, and to tell us whether we shall go ahead or not, either giving us the authority, or delegate the authority to some officer, or to some committee of the Institute to put the revision through. If we are to continue it, then we think we should have the financial assistance we need for handling the work, and put it in position to meet the various demands that necessarily come up in the publication of such a work.

Mr. D. McDonald—I move that the Institute present to the committee its thanks for this report, and that we request these same gentlemen to continue to serve through one more year with the work, and that the Treasursr of the Institute be instructed to pay the cost of printing this report. [Seconded.]

The President put the question and it was agreed to.

Mr. Doherty—Just one word in connection with this before we pass it. The last Question Box publication was presented at the March meeting of the Ohio Gas Light Association, at which time the Editor resigned. I think the work should be continued by the American Gas Institute. I, therefore, move that an Editor be chosen or appointed to carry on the work, the expense of the work to be borne hereafter by the American Gas Institute, the matter of such expense to be in the hands of the Governing Board. Personally, I cannot undertake this work, if it is continued. [Seconded.]

The President—You have heard the motion of Mr. Doherty. What is your pleasure?

Dr. Harrop—I certainly hope before this matter of the Report of the Board of Revision is closed there will be an expression of opinion by the members on its work.

Mr. W. Clark—I think that is shown by Mr. McDonald's motion. Dr. Harrop states he would like to obtain an expression of opinion with regard to the report, but it seems to me there can be but one opinion in regard thereto. It certainly is excellent, and we cannot too heartily thank Dr. Harrop and Mr. Stone for what they have done for the Institute. I understand that they are responsible for this volume. As to the question of the continuation of the work of the Question Box, that has also been excellent, but it occurred to me to suggest whether or not that had not better be left to the Governing

Board. They know better than we do the present condition of our finances. Undoubtedly, that work, or a work of essentially the same character, should be carried on, but just how and under what circumstances, and whether or not we are in a position to begin it now, are questions that can be better answered, as it seems to me, by the Governing Board. Certainly, I am not in a position to have an opinion on that subject.

Mr. D. McDonald—In line with what Mr. Clark said regarding the Question Box, it seems to me that it must be two years ahead of the Revision Committee. In order to put the Revision Committee into shape where it will be the most valuable to us, I think that should remain with the Governing Board even if it results in the Question Box lying dormant for a while. It will not do any harm if it results in that, because the Revision Committee cannot catch up with the present Question Box for some time to come. I think it should be left with the Governing Board, just as Mr. Clark said.

Mr. Doherty—I know more, perhaps, about carrying on the work of the Question Box than a great many here, because that was in my hands entirely. When the work was first started, great effort and considerable expenditure were required to get the gas men of the country interested in the work. Various means were tried to arouse interest, but finally a system of advertising was used similar to the "follow-up" system used by mercantile houses around the country. The result of it was that the number of contributors and of men who became interested in the Question Box continually grew. I think the last Question Box had something like 570 contributors. The need for active work and pushing of the Question Box was largely due to the fact that the scheme had made an unfavorable impression on a great many of the prominent gas men of the country, consequently they did nothing to help it for some time. Gradually, however, when they became better acquainted with the plan, saw what the work was and what it was intended to do, and that it was run, not particularly for the education of the best engineers in large plants, but rather to bring up the education of the men located in the small gas works who did not have the benefit of association meetings and matters of that sort, then all that opposition disappeared until to-day there is practically none that I know of. Now a great many are interested in the work, who are willing to contribute without any expense at all the information which they possess that we want for this purpose. The work has grown steadily. As much as $3,500 has been expended on that publication in 1 year. It can be carried on very well now, however, by just availing ourselves of the men who are already contributing for an expense of from $600 to $1,000 a year. I believe the work ought to be carried on and should be kept up very much ahead of the work of the Revision Committee. The Revision Committee is not going, as I understand it, to publish a broad revision of all the work, but is going to publish a revision of sections from time to time. It will not interfere with the work, if the work of the Question Box is 10 years ahead of them, because it will enable them to work on one section to have that section right. I feel that the Revision Committee has broadened the work of the Question Box Committee, although with regard to the last publication of the Question Box no very serious effort was made to rouse interest in the country, and it was not pushed as aggressively as previous publications had been. A few moments ago some of the members here were willing to sacrifice a large source of revenue, that coming from advertising, as a matter of dignity or sentiment. But that has not been allowed to stand in the way of the success of the Question Box. It is already doing good. I know of the good that the Question Box is doing because of numerous letters received from different men who have sent for a copy of the book, and I know it is valuable to the gas men of the country—not necessarily to the men here to day, but to the men at home. I believe the work ought to be continued, and it can be continued without the expenditure of any very great sum. I think it should be continued by the Institute, and if the Institute will not pay the necessary expense, I will contribute $1,000 to keep that publication up myself if anybody will undertake its publication. (Applause.)

The President—That is the way to talk.

Mr. Norris—If this resolution is going through, I think there should be some definite limit placed upon the expense to which the Institute is liable to be subjected. As I understand the motion, it is that the expense must be borne by the Institute. As has been stated, the expense did run as high as $3,500 a year, and I think it would be difficult for the Institute to expend even half of that, and if the expense is to be any such large sum, I do not think this motion should be allowed to pass without giving some care and thought to the matter. I would suggest, therefore, if the resolution is to be adopted, that it might go through in some such form as this: Express the Institute's appreciation of the work and of its belief in the usefulness of the Question Box as a method of reaching gas men, and that it is the sense of the membership that the Institute ought to help support financially, the amount of that support to be left to the Governing Board.

The President—That would be a recommendation to the Governing Board of the Question Box for favorable consideration.

Mr. Norris—I would be in favor of giving it all the money it can properly use and we can afford to spend, but I think that the amount of the expenditure should be under the control of the Governing Board.

Mr. Doherty—My motion was to leave the matter of the expenses in the hands of the Governing Board.

The President—That is as I understand it.

Mr. Stone—Pardon me if I speak on the subject. We found in making up the paper that one of the serious objections to the Question Box, or rather one of the hardships which we had to overcome in revising the material, was the disjointed manner in which the information was given. In many instances there was no connection to it. There would be a whole lot of information on some one subject and nothing at all on others, so that in making up this publication I found it would be necessary to examine the records of the American Gas Light Association back for 10 or 12 years, the Western for 8 or 10 years, and the Ohio from its beginning, and all text books and technical papers back for some years, in order to get what little information is in here. This leads me to think there is some sort of a solution to this question. I have thought, since I have been sitting here listening to the discussion, it might be well to allow the Board of Revision to publish one section each year, letting them ask the questions on which they desire information. Let the chairman of a section, for instance, if it is to be published next year, send out a printed list of questions for his section, asking for the information he needs to complete his work. And then, immediately after the answers come in, let him analyze the answers and select such of the material as is needed for the section to be published next year. By handling it in that way, it seems to me the expense will not be as much as it appears to have been in the past, in which way the work can be handled satisfactorily, for we can get one section up to date, and we can get the information that more particularly pertains to the publication of that one section.

Mr. Doherty—It is not altogether an easy matter to determine what we would like to have in the Question Box. Mr. Stone suggests that one of the criticisms made is that the information is not complete and is disjointed. It should be remembered, however, that when you are asking for a voluntary contribution you must accept what is sent you. You cannot reject it, for if you do and then ask for something more you probably would get nothing. The work was very difficult to start with. As I said, however, a great deal of that early difficulty has been done away with. The work can be simplified from time to time. Starting it earlier you can get your replies earlier. Each year the work becomes very much easier. We are now in a position to get better information and of a more diverse nature. Now it is only a matter of encouraging everybody to express their views. My experience in connection with Question Box work leads me to believe that Mr. Stone cannot send out from a given committee requests for answers to certain questions and get replies from them. Many may not have any information upon the particular subject regarding which he would inquire. I think particularly, Mr. Chairman, the Question Box work should be carried on in advance of the Revision Committee, who I think can get all the information needed by the regular mailing system. It makes no difference whether your list contains 180 or 600 questions, so far as the expense is concerned in sending it out. If necessary, the questions submitted by the committee on which they wanted information could be marked with a star, and everybody would understand that that was to be answered. The only interest I have in the matter is that I believe the Revision Committee, to effectually carry on its work and publish a complete handbook on gas manufacture, must know what the gas men of the country want. Whenever you pick up a handbook on a technical subject and look through it, no matter what it may be, it is apt to produce a very different impression upon you than when you are looking for information upon some particular matter. You look it through and are impressed with the great amount of information that it contains, but when you start to look for something specific you are impressed with the fact something is left out. If everybody is asked to answer questions on everything you can limit the amount of information which must be gathered by original experiment to a very small amount because you can make information which is known to one man common to all. I believe that Question Box work ought to be carried on, and I believe that the general plan which was in vogue

was the best that can be adopted. It can be improved from time to time, and can be made a great help to the work of the Revision Committee. When the Revision Committee wants information it can send its questions to the Question Box Editor, and in that way, be gathering information for all, it is going right back into the hands of the Revision Committee.

The President—Mr. Doherty, will you state your motion again, please?

Mr. Doherty—My motion, Mr. President, was that the incoming President appoint an Editor for the Question Box, and that the expense hereafter be borne by the American Gas Institute, under the control of the Governing Board. My idea was that they would fix the amount that should be expended.

The President put the motion and it was declared adopted.

The President—The next thing on the programme is the Question Box, by Mr. H. L. Doherty, of New York.

Mr. Doherty—I resigned last March, Mr. President. I think we have just had a very good talk on the Question Box, so I do not think there is anything more I can add.

Mr. Shelton—Mr. President, I think, as representing the committee on papers and material for this meeting, it was recognized that within the short time intervening between last March and this meeting we would be unable to secure a sufficient presentation of the Question Box, and it was, therefore, not expected that a report to this meeting would be made covering the Question Box. I think that reference to it on the programme is an error.

The President introduced Mr. W. H. Gartley, of Philadelphia, who read the following paper on

DELIVERY OF UNIFORM CANDLE POWER TO THE CONSUMER THROUGH ALL SEASONS OF THE YEAR.

The purpose of this paper is to deal with the effect upon the candle power of the gas of those variable temperatures in the commercial holder and distribution mains, sure to be met with and beyond the control of the gas engineer. Quoting from Mr. A. E. Forstall's paper on condensation:

"Condensation is perfect only when the gas leaves the apparatus carrying such an amount of the most valuable hydrocarbons originally present in it as it passes out of the retort as will just fall short of saturating it at the minimum of temperature and maximum of pressure to which it will be subjected during its journey to the burner."

Although this sentence, as written, refers to coal gas, it is equally true and more important for water gas, which usually contains a higher percentage of the most valuable hydrocarbon vapors that may be carried to the burner. Continuing quotation from Mr. Forstall's paper:

"The attainment of this perfection of condensation is rendered difficult by the fact that the various hydrocarbons have a solvent action upon each other, which makes it almost impossible to condense out the vapor of anyone of them, even though its boiling point be high and its tension low, without at the same time bringing down more or less of those vapors with low boiling points and high tensions that, if diffused in the gas, after the heavy vapors have been removed, would be retained under all conditions of temperature and pressure met with during distribution, while on the other hand the lighter vapors held up at low temperature some of the heavy vapors that but for this mutual action would be condensed out at comparatively high temperatures."

The solvent action that these hydrocarbons have upon each other, referred to by Mr. Forstall, will bear a little closer consideration.

When a gas saturated with hydrocarbon vapors is cooled, an infinitesimal fraction of 1°, it will be in equilibrium with its condensate and the proportion of the component vapors in the gas and in the liquid bear a fixed relation to each other. This is expressed in a law formulated by Mr. H. Anderson, of Philadelphia, as follows:

"When a gas is in contact with a mixture of liquid hydrocarbons under condition of equilibrium, each of the components of the liquid makes its vapor tension valid in the gas in proportion to its molecular percentage in the liquid."

Let us suppose, for example, a gas at 50° F., standing in equilibrium over a condensate made up of equal parts by weight of benzene and toluene.

The weight of a molecule of benzene, C_6H_6, is 78, and of toluene, C_7H_8, is 92. The number of molecules of each in a mixture of equal parts by weight would be in proportion for benzene $\frac{50}{78}$ and for toluene $\frac{50}{92}$ or as 641 to 543, and the molecular percentage of benzene would be $\frac{641}{641 + 543} = 53.1$ per cent., and molecular percentage of toluene would be $\frac{543}{641 + 543} = 45.9$ per cent. The vapor tension of the composite vapor in the gas would be:

	Vapor Tension at 50° F.		
From benzene .541	× 45.2 mm.	=	24.543 mm.
" toluene .459	× 10.5 "	=	4.819 "
			29.272 mm.

And the percentage of vapor in the gas would be $\frac{29.272}{760} = 3.85$ per cent., of which benzene would be $\frac{24\ 453}{29.272} + 3.85$ per cent. $= 3.22$ per cent. and toluene would be $\frac{4.819}{29.272} \times 3.85$ per cent. $= .63$ per cent.

We see that a gas standing over equal parts by weight of benzene and toluene, with which it is in equilibrium, will contain 3.21 per cent. by volume of the vapor of benzene and .63 per cent. by volume of the vapor of toluene. The deduction follows that when a gas saturated at 50° F. and containing 3.22 per cent. by volume of benzene and .63 per cent. by volume of toluene is cooled very slightly, it will drop out benzene and toluene in equal proportions as to weight. The weight of equal volumes of vapors of toluene to benzene being as 1 to 1.18, there is left in the vapor in the gas an increased percentage of benzene to toluene; with such a vapor the condensate of equal parts is not in equilibrium and a re-arrangement results through which some of the benzene vapors in the gas go to the condensate. This is what Mr. Forstall refers to as solvent action.

When a gas, saturated with hydrocarbon vapors, comes in contact with a condensate from which it is far removed from equilibrium, the re-arrangement to establish equilibrium becomes more violent and we say that the gas has been shocked. This explains also why it is important to remove from contact with the gas in the process of condensation the condensate at about the temperature at which it was deposited. To do this requires large volumes of cooling space, which cooling must be conducted in gradual steps.

While the proportion of high to low tension vapors in the gas is constantly increasing during the condensation process, bear in mind that because of the cooling the composite vapor tension is decreasing.

It also appears that we cannot expect theoretically an entire elimination of the tar vapors from the gas; at each step a portion is taken out, indeed a large per cent., but even with a perfect dephlegmation there would be a trace left to be carried to the burner.

In water gas practice, the problem of condensation reduces itself to the elimination from the gas of as much of the vapors of tar as possible, without leaving behind in the tar any of the high tension vapors that can be carried to the burner. To do this, the gas should be cooled as gradually as the condensing apparatus permits and should pass into the purifiers at not less than 100° F., and through them without any loss in temperature. Under these conditions, the gas will reach the inlet of the commercial holder with only such changes in temperature throughout the year as the varying atmospheric temperatures between the purifier outlet and the commercial holder inlet may effect. During the process of condensation and purification, the temperatures maintained should be those best suited for the mechanical and chemical reactions, and should be unaffected by the varying atmospheric temperatures at different seasons of the year.

The gas arrives at the commercial holder saturated with composite vapor, some of which must be dropped on further cooling. Some will be dropped in the commercial holder and some in the mains. Sample of oil taken January 25, 1906, from on top of water in the commercial holder tank:

	Per Cent.
Benzene	11.3
Toluene	28.3
Abv. toluene	60.4

Samples taken from street drips, March 14, 1906:

	Drip 2¼ Miles from Works. Per Cent.	Drip 5 Miles from Works. Per Cent.
Benzene	12.2	18.8
Toluene	52.8	54.0
Abv. toluene	35.0	27.2

This is from a mixture of 6 parts of water gas, made from Texas distillate, to 1 of coal gas.

On Plate I. are shown the temperature curves of atmosphere and street main temperatures in 30-inch main at the gas testing station located 1 mile from the works. While the temperature of the gas at the inlet to commercial holder varies from 90° in summer to 72° in winter, you will note that the temperature of the main at the testing

station varies from 75° to 35°. What is the result of such a reduction in temperature upon gas containing approximately 3½ per cent. of condensible vapors of a composition as stated?

For a clearer understanding of the influences of cold weather on the gas in the commercial holder and mains, let us apply the principles of equilibrium of a saturated gas and its condensate to a dephlegmating column; that is, a condensing column in which the gas flows upward against its condensation. As the gas rises from warm temperatures at the bottom to cooler temperatures at the top, the vapor in the gas in the upper and cooler part, through previous separation of condensation richer in low tension vapor, will be proportionately richer in high tension vapor and will shed condensation with a gradually increasing proportion of high tension constituents. This condensation, in dropping down the column and meeting gas shedding condensation less rich in high tension constituents, will, to establish equilibrium, give off some of its high tension constituents to the gas.

This is, theoretically at least, the ideal method of condensation; by having such a column with the base temperature so hot that only the least trace of high tension vapors can stay in the condensate, and the top at the minimum temperature to which the gas will be exposed in the mains, we would conserve to the gas the maximum of high tension vapors and have no condensation after the column.

On Plate II. is shown the percentage of loss of candle power by passing a sample of the gas from holder inlet through a cooling coil. The coil consisted of 7 turns of ½-inch pipe, immersed in a water bath, the temperature of the bath and velocity of flow being so arranged that the gas arrives at the temperature desired at the point of exit. The inlet temperature was maintained at exactly 70°, care being observed that the sample did not fall below 70° before entering the coil. Tests were made by passing the gas downward and another series upward from 70° to 60° F.; 70° to 50° F.; 70° to 45° F.; 70° to 40° F.; 70° to 35° F.

The failure of the 3 curves to coincide will be understood.

On this chart is also shown a curve, laid down from observation, of the loss in candle power between the works and testing station in Philadelphia for variations in temperature throughout the year. We do not lose as much candle power in practice as is shown by the coil. There appears to be in the holders a better dephlegmation or slower cooling than in the coil.

At first blush it would appear that, with the knowledge given on Plate II., as to loss of candle power for any given fall in temperature, as shown by the thermometer in the 30-inch main at the testing station, we could calculate readily what should be the candle power of the gas at the commercial holder inlet to produce say 22.5-candle power at the testing station.

Our experience has shown that the problem is somewhat more complicated. A gas in its passage through the mains is affected in temperature at different points by local conditions. The deciding condition is the temperature of the ground at the varying depths of the main. The temperature at which the gas enters the main does not have any noticeable effect on the temperature of the gas in the main at even a short distance from the works. The total heat units given up by the gas are quickly dissipated through the large mains and surrounding ground, and the gas soon arrives at the temperature of the earth surrounding the mains and continues at such. In a long run the main varies in its depth below the surface. In the winter, where it approaches the surface, or for other reasons, such as crossing under a bridge, there will be points where the gas is chilled below the temperature that would be shown by the thermometer in the main at the testing station. At such low temperature points there will be, of course, a final deposition of vapor, and after leaving these points, being again somewhat warmed, there will be a tendency towards drying up of any condensate that may be encountered in the main, and when this is accomplished subsequent gas will pass on unsaturated.

Our curve deals only with gas saturated at each temperature, consequently there is introduced a disturbing factor when we attempt to figure out what the candle power must be at the holder to yield a desired candle power at the testing station, the temperature in the main at the station being known. Since the gas in warming from its minimum temperature cannot deposit condensation, it cannot lose in candle power, and it therefore becomes necessary to determine its vapor dewpoint at testing station instead of its temperature.

Plate III. shows a so-called hygrometer designed for this purpose. It is made up of two concentric tubes, the concentric chamber being closed at the top, having an opening at the bottom and side. The inner test tube contains, to about ⅓ of its depth, some highly volatile liquid, such as pentane, and is equipped with a glass dipping tube and hand pump for bubbling air through the pentane, the resulting carburetted air passing out at the opening in the cork and conveyed beyond the danger point by a small rubber hose. The gas passes into the concentric chamber, between the inner and outer tube at *A*, and passes out at *B*, where it is allowed to escape or is burnt. By bubbling the air from the hand pump through the pentane, the temperature of the air can be reduced and measured on the inserted thermometer, so that when it arrives at a point where there is condensation from the gas on the outer side of the inner tube, we can read from the thermometer the dewpoint of the gas, either for aqueous vapor or for hydrocarbon vapor. If a preliminary chamber, containing calcium chloride, is attached to the bottom of the hygrometer at *A* and the gas is first passed through this chamber, the dewpoint observed will be that of the hydrocarbon vapors. If this preliminary chamber, or a similar one, is attached, loosely filled with black rubber, such as fine rubber bands, the hydrocarbon vapors will be absorbed, and the observed dewpoint will be that for aqueous vapors.

Referring again to Plate V., curve *f* shows the saturation temperature for the gas at the testing stations throughout the year, and is given to show, in a general way, how it varies from the observed temperature. Curve *e* on Plate I. shows the temperature inside the smaller street main, the observations being taken at one point about 2½ miles and another about 4 miles from the works. It will be observed that they do not materially vary from those at the testing station, and we may safely assume that the hygrometric readings at these points bear the same close relation to those at the testing station, so that by carrying in the winter a slight excess of candle power at the testing station, we may, and by observation we know, that we are delivering the required candle power through the city mains.

Plate VI. shows the mean atmospheric testing station dewpoint and testing station main temperatures in February and July, 1906.

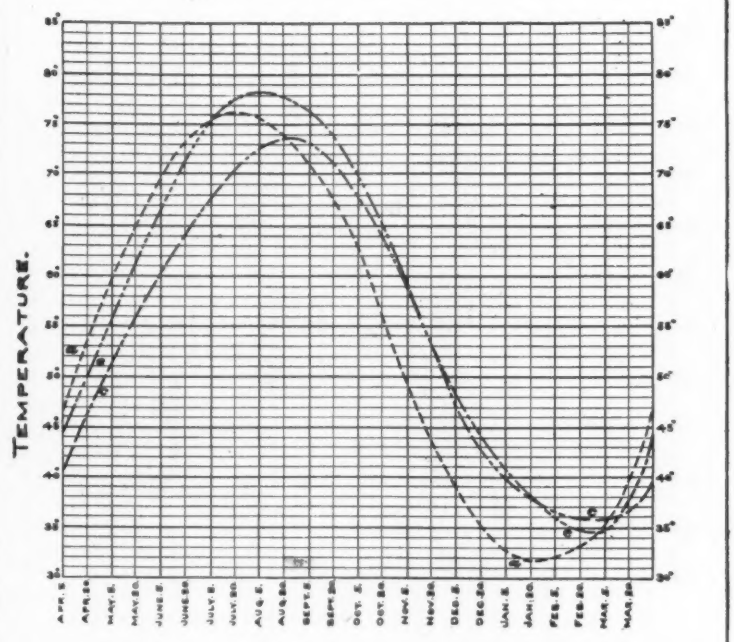
In Philadelphia the candle power readers at the testing station determine the hydrocarbon vapor dewpoint of the gas in the main and report it to the works. By referring to the curve on Plate IV. the superintendent determines what must be the candle power at inlet to holder. This curve is laid out from data given by the curve on Chart II., which,

PLATE I

CURVE *a* MEAN ATMOSPHERIC TEMPERATURE 35 YEARS.

c TEMP. OF DISTRIBUTION MAINS 1 MILE FROM STATION A.

e " " GENERAL DISTRIBUTION MAINS.

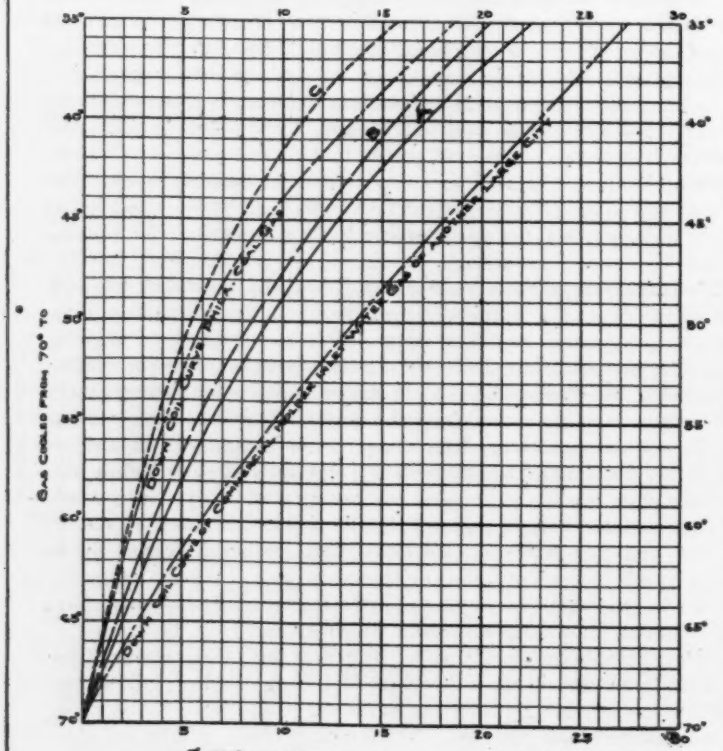


THE UNITED GAS IMPROVEMENT CO.
PHILADELPHIA WORKS.
SEPT. 26 1906. B-Q-76.

Plate II

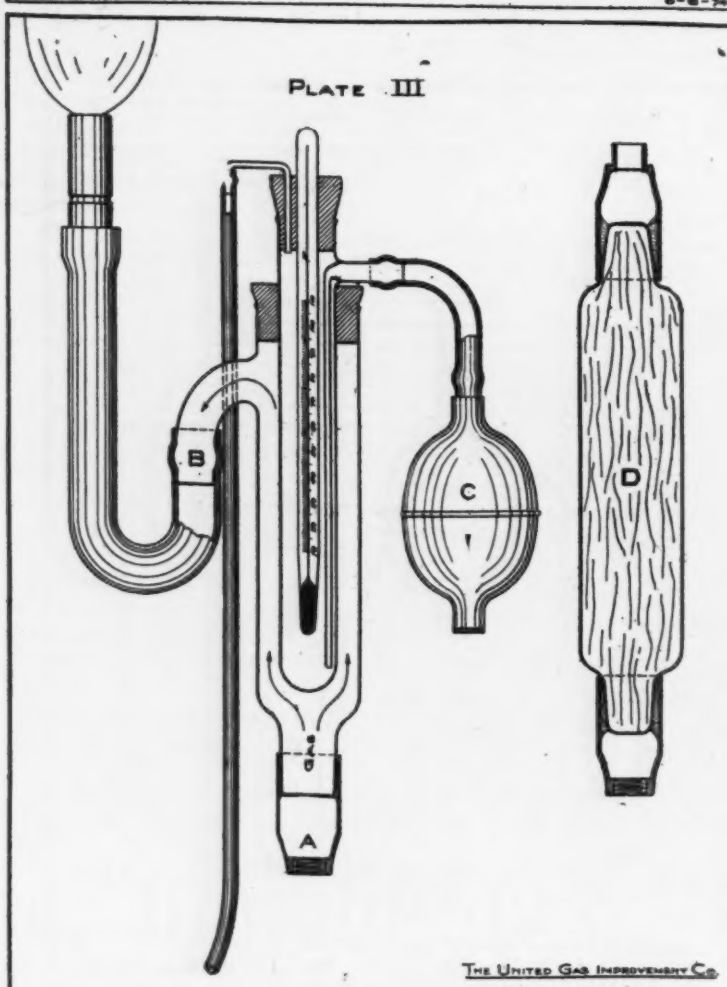
Curves of Loss in Candle Power by Reduction in Temperature.

Curve A - Down Coil
Curve B - Up Coil
Curve C - Phila. Holder & Distribution Mains
At Test Stations.
A, B & C From Mixed Gas, 6 Parts Water Gas (Texas Oil Distillate) to 1 Part Coal Gas.


Gas Cooled from 70° to
% of Candle Power Loss
Down Coil Curve Phila. Gas Co.
Down Coil Curve of Commercial Mixed Water Gas of Another Large City

The United Gas Improvement Co.
Philadelphia Works
Sept. 27, 1906. 8-G-70

Plate III

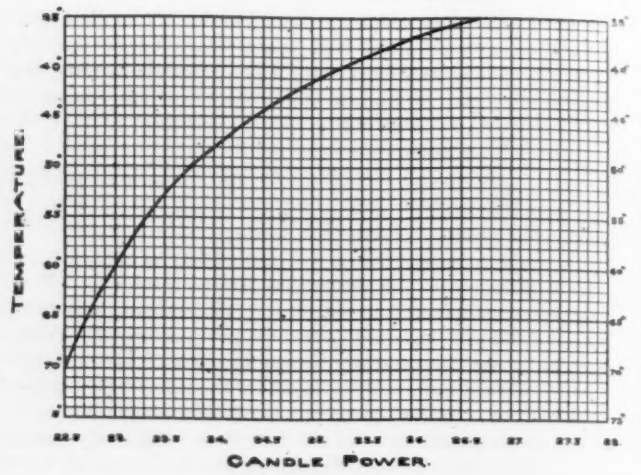


The United Gas Improvement Co.
Philadelphia Works
Sept. 24, 1906. 8-G-72

Plate IV

Inlet Gas Candle Power Required to Maintain 22.5 C.P. Candle Power at Test Station vs. Temperature of Hydrocarbon Vapor Dewpoint at Test Station.

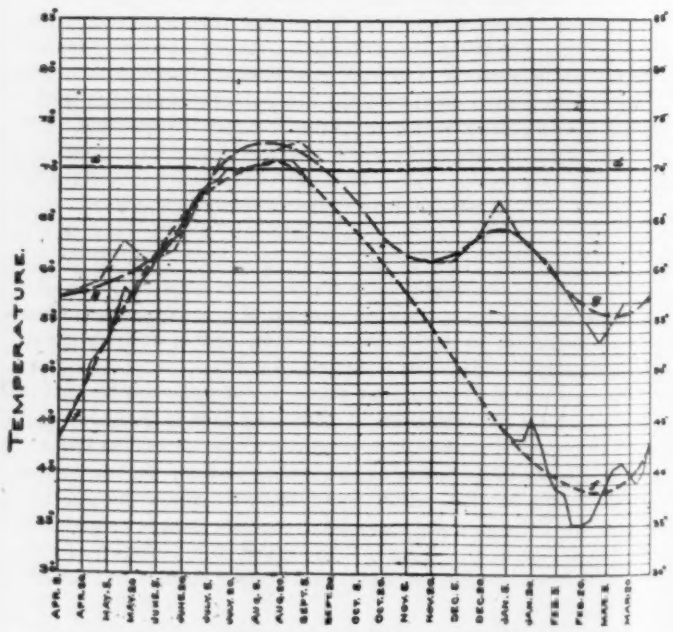
Note:-
Observe Hydrocarbon Vapor Dewpoint at Test Station, use as ordinate, and read from curve necessary candle power required at Commercial Holder Inlet to yield 22.5 candle power at Test Station.



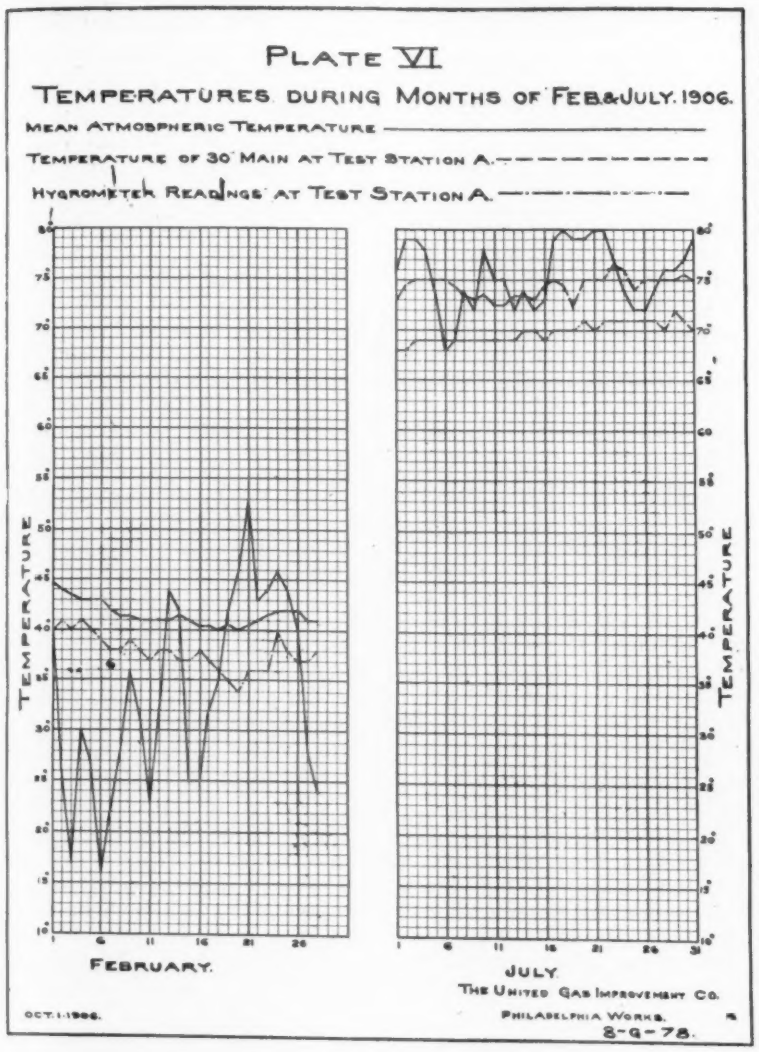
The United Gas Improvement Co.
Philadelphia Works.
May 1, 1906. 8-G-61.

Plate V

Curve d Temperature of Photometer Bath
f Hygrometer Reading at Test Station
g Holder Outlet



The United Gas Improvement Co.
Philadelphia Works.
Sept. 25, 1906. 8-G-73.



as stated, has been drawn from our observations of loss in candle power between the works and testing station throughout the year.

We are required to maintain 22-candle power at the testing station. Allowing ½ to ¾-candle power extra for any future reduction in dewpoint between the testing station and the consumer, we are convinced by hygrometer and photometer observations in other parts of the city that we have delivered 22-candle power to the remotest points. With this method in use, we find that no importance need be attached to the loss of candle power from friction in the mains and other vague causes.

Anticipating one point in the discussion of this paper, I attach Plate V., showing general smoothed-out curves of dewpoints of the gas at outlet of holder and at the testing station main. You will readily conceive the fluctuation in the dewpoint from hour to hour at holder outlet, influenced as it is sure to be by weather changes and speed of warm gas through holder.

The curves on Plate V., as well as those on Plate I., must be understood as simply curves showing generally the temperatures that will be encountered by the gas. They are not to be considered as of actual daily use.

Curve *g* will necessarily vary for each works. Experience shows that hourly changes of dewpoints at holder outlet are less than might be expected. At station A, using two 300,000 cubic foot holders, sending out about 16,000 cubic feet mixed gas per diem, the dewpoint varied between 59° and 56°, while the thermometer fell from 42° to 20° F. Even here the gas has lost approximately .8 of 1 per cent. of its candle power in cooling from 59° to 56°, and the superintendent should be able to keep this fact in mind so clearly that there will be no alteration of operating conditions to get a gas that will "hold-up" better. We must realize that whatever the change in the dew-point at holder outlet, if that dewpoint is above that at the point in the distribution system corresponding to the testing station, there need be no anxiety felt, because the candle power at the testing station will not be changed.

If, however, the attention is chiefly directed to the holder inlet candle power, which may always be led to the photometer saturated at some standard temperature, selected here at 70°, by passing through an up coil, immersed in bath at 70°, we have a solid basis to work on unchanged throughout the year.

I have intended in this paper to lay down the general principles of a method for securing not only uniform candle power to the same consumer from hour to hour, but a method that will give gas varying only slightly in candle power over the entire distribution system.

In order to show the uniform candle power delivered to the consumer by the application of this method in Philadelphia, I give the average daily candle power during a period of low dewpoints; that is from March 16 to April 1st. Each day shows the average of the 24 hourly observations by the candle power readers at the testing station—the candle power desired to be carried was 22.75:

Date.	"A"	"B."
March 16th	22.69	22.96
" 17th	22.52	22.63
" 18th	22.44	22 56
" 19th	22.54	22.83
" 20th	22.90	22.86
" 21st	22.67	22.73
" 22d	22.74	22.71
" 23d	22.60	22.43
" 24th	22.78	22.49
" 25th	23.04	22.79
" 26th	22.75	22.76
" 27th	22.82	22.63
" 28th	22.52	22.35
" 29th	22.88	22.35
" 30th	22.92	22.48
" 31st	22.66	22.44

It has been found that the lowest dewpoint temperature will be coincident with thawing weather, following severe frost, when the cold water soaks deeper in the ground. We did not arrive at this seemingly simple method without meeting many contradictory and disappointing results that cannot be touched on without using too much of your valuable time, but I hope you will permit me to speak a little further on the subject of photometry and the precautions necessary in getting reliable, comparative results in 2 photometers situated 1 mile apart.

We read candle power hourly, both at the works and testing stations, the candle power readers having no other duties. They work in 3 shifts of 8 hours, and at both the works and testing stations report to a chief photometrist, who, with the superintendents, reports to the engineer of works. In the works' photometer room, the works' superintendent has no authority and has no control over candle power readers' work, except to request more frequent readings if desired.

Each works makes coal gas and water gas and for photometric samples a separate coil immersed in a 70° bath is provided for each gas; that is, one for each of the coal gas, water gas, mixed gas at holder inlet and commercial gas. Also a separate photometer meter is provided for each kind, through which the sample is kept constantly flowing, to be switched on to the photometer burner as desired. Hourly readings are taken of the candle power of each gas and more frequently if desired by the superintendent. At each works 2 bar photometers are provided and are in constant use in adjoining rooms, thus giving a check upon each other if there is reason to doubt the accuracy of either from some undetected maladjustment. At the testing station the temperature of the gas must not be allowed to fall below main temperature outside.

For such frequent readings, and particularly in a climate like that along the 42d parallel of latitude, we found it necessary to abandon candles promptly. Our experience with candles gives good ground for the statement that, under the conditions enumerated, standard sperm candles are impracticable as a source of light.

The representative of the municipality, Dr. N. W. Thomas, after carefully weighing the merits and demerits of the different lamps, decided upon adopting the pentane lamp. After 6 years' experience with this lamp, having 12 in constant use, I am inclined to urge the Institute to take necessary action to make such further investigation of its peculiarities as will be necessary to adopt it as a standard of light for the gas companies of this country, or reject it in favor of something better.

While the Carcel, Hefner and Harcourt 10-candle pentane lamps are all in use, our investigation discloses the fact that but one of these, the Harcourt, 10-candle pentane lamp, has been adopted as a standard by legislation. This lamp is the standard for the Gas Referees of London, the Examiner for the London County Council, the National British Physical Laboratory and is also used as a standard in the Electrical Testing Laboratory in New York. In this country it has been the subject of investigation and some of the results have been presented to the Gas Associations. They indicate the need of making further investigation as to certain peculiarities.

We are dilatory in taking action on standardizing photometrical methods in this country. The urgency of action arises from the tendency of municipalities and State authorities to frame laws regarding inspection of our product. In the case of the District of Columbia, Congress legislated that the gas must be equivalent to 25-candle power, measured on a Bunsen photometer. This was the same photometer specified in the Gas Work's Clauses, Act of Parliament, 1871, which goes with considerable detail into the method and apparatus required. In later legislation by Parliament, providing for the appointment of Referees for certain companies, much of this method of testing described in the Act of 1871 was repealed and left to the Referees for those companies with which they were officially connected, but Parliament in all these Acts specified that, for common illuminating gas, the candle

power shall be determined by burning through a Sugg's London Argand burner. The Gas Referees of London, having to deal with gas of 12 to 16-candle power, have made seemingly wide departures in the method of photometry, and the gas companies of this country have not followed them. If, therefore, we do not get together and formulate specifications based on proven scientific methods, we will have less cause to complain if we are served with something in the way of legislation that proves difficult to digest. As an illustration, this year, in one of the large cities, a university professor was engaged by a newspaper to make observations of the candle power furnished by the gas companies; he used a photometer that recommended itself largely because it could be carried in an ordinary suit case. I will say that no observations are entirely accurate when the gas saturated with hydrocarbon vapor, or nearly so, is passed through rubber connection.

To be Continued.)

[Concluded from Page 1074.]

Historical Notes.

[Presented to the last meeting of the Pacific Coast Gas Association, by Mr. George P. Low, the Association's Historian.]

Nevada City.—Is entitled to the distinction of possessing the third works erected in California for the manufacture of artificial gas, its predecessors being the San Francisco Gas Company, which began operations on February 11, 1854, and the Marysville Gas Company, which dates from 1858. The Nevada City gas works (which afterward became incorporated as the Nevada City Gas Company) were built by Messrs. J. S. Kaneen and Amariah Pierce, in 1859, thus outranking Portland, Ore., which started in 1860, and San Jose, Napa, Oakland and Stockton, which followed in the order named shortly after.

The Nevada City works were built by the gentlemen named by their own hands, with the assistance of those of a single helper. They themselves punched and riveted the holder and dug the pit therefor, and built the benches, condenser, scrubber and purifier—in fact the whole works. It was a coal gas plant containing 2 retorts in a bench, there being 2 benches. The retorts were 6 or 7 feet in length by a width of 2 feet and a height of 12 inches. The condenser was of the skeleton type, made of 3-inch cast iron pipe, standing about 3 feet high, with 8 or 10 bends. The purifier was a simple wooden box, 4 by 6 feet in size and 3 feet deep, in which slack lime was used as a purifying agent. The scrubber was of iron, also 4 by 6 feet in size, but standing several feet high, near the top of which was placed a basin of cast iron, the bottom of which was perforated through which water would run. The washer was similarly built, with the exception that it contained limbs and branches of trees in short pieces, as well as coke; for the scrubber and washer were separate pieces of apparatus. From the washer gas was taken direct to the holder, which had a capacity of 4,500 cubic feet.

These pioneer works were located at the junction of Main and Coyote streets. Gas was made of pitch pine and resin oil, the pine wood being cut into sticks 1-inch square and 4 feet long. These sticks were then put into formers, consisting of D-shaped loops of wrought iron, so as to shape the bundle of sticks into a form that would fit closely into the retort. Before being placed into the retort, however, each bundle would be saturated with resin oil, the period of retorting lasting for about 1½ hours. The distribution consisted of about 2 miles of 3-inch cast iron mains, the holder pressure being 20-tenths of water. Eight and 10-foot burners were used. At the beginning, gas was sold for $5 per 1,000, which was regarded as a fair rate, in view of the cost of wood, which probably averaged $11 per cord for selected pitch pine. Messrs. Charles H. Simpkins and Amariah Pierce were the owners of these works, which were afterward incorporated into the Nevada City Gas Company.

Mr. Kaneen, after supervising and building the plant, remained as its Superintendent until 1863, when he went to Virginia City, Nev., to supervise the erection of the Virginia City gas works. There pitch pine was also used; and although it cost $50 per cord, he had some consolation in the rate of $15 per 1,000 cubic feet which was charged for gas, and in the further knowledge that under his superintendency, in a single year, the Virginia City Gas Company disbursed $92,000 in dividends, after paying all new constructing and operating expenses. In view of the fact that the plant represented an investment of probably less than $50,000, the owners felt the pricks of conscience, so that during the year that followed the price was reduced to $12.50 per 1,000, then by stages the reductions were to $10, $8 and $6, where it remained until Mr. Kaneen left the works in 1885, to enter the service of the Los Angeles Lighting Company.

As time wore on the Nevada City Gas Company passed into the ownership of the wife of Mr. Meyers Allen, from whom it was purchased by the California Central Gas and Electric Company, October 1, 1899. At that time illuminating gas sold for $5 per 1,000 and fuel gas at $3, in contrast with which we have the present rates of $2.50 and $2 respectively.

Petaluma.—Here for years the gas works pursued a career of all but disheartening failure from the very inception. As originally installed by the late Peter Donohue about the year 1867, it, at the very outset encountered such an insuperable obstacle in the high price of materials that the public would not buy gas at the price charged, so perforce the plant was closed down after running a comparatively short time. Beyond the fact that it was a coal gas plant, no data concerning the gas making plant has been obtained. After a period of idleness, the plant was bought by a Mr. Farmer and associates, who moved it to the lower part of town on Petaluma Creek, where a new plant was erected, and by the time of its completion the business had been incorporated under the name of the Petaluma Gas Light Company, which continued in existence until the latter part of 1900, when it was purchased by the Petaluma Gas and Electric Company, thus putting an end to a long period of warfare and thus, for the first time, effecting a combination of the gas and electric interests of Petaluma.

In Mr. Donohue's original gas works about 2 miles of cast iron mains, in 6-foot lengths, and which were brought around the Horn from Scotland, were used. They were of 4 and 6 inches in diameter, and though they had been in the ground for over 30 years, when taken up a few years ago they were still in very good condition, with the exception of certain stretches that had been in very low ground. In these cases the percolations of the brackish water of Petaluma Creek had destroyed some of the pipe, which had been in use continually since the time of Mr. Farmer. The writer is not able to state what the price of gas was during Mr. Donohue's time, but in 1880 it was selling at $10 per 1,000, which was afterward reduced to $8; then to $6, in 1887, then later to $5, and finally, in 1899, to $2 for lighting purposes and $1.50 when used for fuel.

It was probably prior to 1887 that the plant passed into the hands of Mr. I. G. Wickersham, the banker of Petaluma, who enlarged the system by running more mains about the town. Coal gas was still being made, according to the old system installed by Mr. Donohue, when, in 1897, Mr. F. W. Van Syckle succeeded in inducing Mr. Wickersham to allow him to change the coal gas system to an oil gas system, using crude coal oil to generate gas through the medium of the Van Syckle process. The change was made as Mr. Van Syckle had recommended. About 30 gallons of oil were consumed per 1,000 cubic feet of gas manufactured, but most of this oil was used in heating the blast furnace. The amount of gas produced per day varied from 4,000 to 4,500 cubic feet, its illuminosity ranging from 23 to 24-candle power.

The Van Syckle process was interesting, even if neither satisfactory nor profitable. In the gas which it produced a certain percentage of air was allowed to enter and mix with it in a simple mechanical combination. Then of an evening, anywhere at the center of distribution or thereabouts, the gas jets in the stores would first whistle and burn together, then pop and revive and whistle aga in, in seeming inebriety. Yet at other times, when conditions were just right, a fair illumination would be given, but eternally there would be cast over all a pall of lampblack and soot that ever evidenced deepest mourning for the reprehensibility of this iniquitous gas.

These conditions were tolerated until 1902, when the Van Syckle plant was supplanted by the Santa Rosa-Petaluma gas transmission system. In the meantime it should be stated that with the acquirement of the Petaluma Gas Light Company by the Petaluma Gas and Electric Company, in 1900, and the acquirement of the last named Company by the California Central Gas and Electric Company, in 1901, the lighting and power industries of Petaluma passed under the control of the California Gas and Electric Corporation.

San Rafael.—This city became possessed of a gas works about 28 years ago, when a gas, by courtesy called an illuminant, was made from gasoline, in a little works located on the corner of A and Fourth streets, which supplied a few blocks along the principal streets of the town. A few years later the works were bought by Mr. E. Lee, who moved them to the present location. On this property there was first erected a small holder that was supplied with coal gas from 3 small benches of 3 retorts each. It was a good gas that ran to 22-candle power, and was made from Wallsend coal and purified with lime. The mains were extended up to a junction with the 3-inch mains that formerly distributed gasoline along Main street, and later they were continued over the best sections of the city up as far as Hotel Rafael and beyond in all directions. About this time the San Rafael Gas Company was organized, its principal owners being Mr. Lee and Mr. Oliver Eldridge. Gas sold for $4 per 1,000 at the outset, but later it was reduced to $3.50. at which price it proved so popular as to necessitate re-

peated enlargements in the works, first by a bench of 6 retorts, then by another bench of 6's, and later 2 of the original benches of 3's were torn down and another bench of 6's was erected. Some 5 years ago oil gas was introduced, the present equipment consisting of 2 Jones sets which produce 130,000 cubic feet and 80,000 cubic feet respectively, of 22-candle power gas per day of 20 hours.

Santa Rosa.—The first gas works were located near the north corner of 5th and Mendocino streets, in a frame building since burned, where gasoline gas of the Maxim type was made, eventually to an output of from 10,000 to 12,000 cubic feet per day. Mr. J. S. Kaneen, now of the San Rafael Gas and Electric Company, and who is the most prominent gas man surviving those who were intimately identified with the development of the industry in Santa Rosa, is authority for the statement that this original plant was started and incorporated April 15, 1872, and that gas then sold for $4 per 1,000. No record of the performance of the works was ever made, much less kept, nor is Mr. Kaneen able to remember the name of its principal owner or owners. After a couple of years, however, the works were moved to a lot that is now within the premises constituting the works of the Santa Rosa Lighting Company. About 1875 the system was changed to a coal gas plant originally using Wallsend coal costing $14 a ton, and another Australian, or possibly a Japanese coal that contained an inordinate amount of sulphur. At that time coal for Santa Rosa was taken by barge from San Francisco to Donohue's Landing on the Napa river, and thence by rail to Santa Rosa, for the then so-called Donohue Road was not completed through to Tiburon. The works contained 3 cast iron, D-shaped retorts, a condenser consisting of 6-inch return bend iron pipes standing 12 feet high, and a wooden box purifier in which water-slacked lime was used as a purifying material. A 20-candle power gas was produced.

In the meantime the business has been incorporated as the Santa Rosa Gas Company, its principal owners being Mr. John A. Paxton, since deceased, Mr. John E. Ayer, also of Santa Rosa, and who is now dead, and Mr. A. A. Curtis, now of San Rafael. In 1876 Mr. Kaneen purchased the interest held in the Company by Mr. Ayer, and shortly thereafter another bench of 3's was added. Still later the latter was finished, making 2 sets of 3's that were installed by Mr. Kaneen. The first Superintendent of the plant was a man by the name of Bennett, who was succeeded by Mr. Shackelford, and who in turn was succeeded by Mr. Center, now of Los Angeles.

The comparatively high price of coal made gas an expensive commodity, and much was done under Mr. Kaneen's direction to reduce the cost of its production. For an entire year later in the '70's, gas was made exclusively from the wood of the red fir, costing $4.50 per cord on the grounds of Guerneville, or approximately $10 per cord delivered at Santa Rosa. This was very choice wood, especially selected from old trees that were rich in resin, with the result that 14,000 to 18,000 cubic feet of 20-candle power gas was made from a cord of wood. Some pitch pine was also used, but it was very expensive although it produced no less than 23,000 cubic feet of gas per cord. This statement is, however, merely an estimate, for the pitch pine made gas so rapidly that it was not possible to meter it accurately with the facilities at hand.

For a time gas was made from the refuse of the wineries and vineyards thereabouts. Grapevines, sticks, stalks, leaves and litter would be taken from the vineyards, and the pulp and seed from the crushed grapes would be taken from the wineries and spread out in the sun to dry. It was a hard task to dry this material thoroughly; in fact drying was the main difficulty in using it, but when once dried and used as wood in the retorts, it would make from 5,000 to 7,000 cubic feet of 18-candle power gas per wagon load. It was while using this refuse from the wine that Mr. Kaneen resorted to the use of crude oil to assist the generation of gas. Special pots of cast iron and measuring about 12 by 14 by 8 inches were made and filled two-thirds full of crude oil, then levelled off to the top with sawdust, after which one of the pots was shoved into each retort. The latter was then filled with the grapevine refuse, or with turf, or sawdust or wood or "any old thing," and a good gas—also much tar—would result. The oil would be consumed down to a honeycomb, sponge-like mass, that would cover the bottom of the pot to a depth of an inch or more. Oil pots were sometimes used in making gas from wood, the wood being sawed up into strips about an inch square and 4 feet long, in which event wood costing $4 a cord, and preferably of fir, could be used advantageously. Peruvian oil costing $2.25 per barrel in San Francisco, was used exclusively. It should be emphasized that the making of gas from these materials was not done by choice but necessity arising from the absence of what might be determined legitimate gas making materials. Indeed, the use of grape pomace, etc., was not only unprofitable, but the pomace would cool the retorts to such an extent that gas could be made only with exceeding difficulty.

The gas so made continued to be sold at $4 per 1,000, with a special price of $3.50 to large consumers, until 1886, when it was reduced to $3.50 and $3, respectively. In 1880 the distribution consisted of about 3 miles of mains whence were supplied some 125 consumers through heaters. Mr. John Barr, now deceased, was Superintendent of the works until 1887, when he was succeeded by Mr. Joseph P. Berry, now an attorney at Santa Rosa. The Company pursued an even tenor of existence, until 1886, when the advent of the electric light in Santa Rosa brought about a warfare which gave rise to fallacious beliefs on the part of the public that required almost 15 years of bitter struggle to eradicate. The history of the lighting industry in Santa Rosa is, therefore, replete with interest in that it instructs regarding some of the most egregious errors which may be committed by a well-intentioned but misguided public.

Fixture Location in Residence Lighting.

[A paper read by Mr. F. N. Olcott, before the Illuminating Engineering Society.]

In taking up the subject of residence illumination and location of residence fixtures, we enter into a field that has no set rules, owing to different tastes of owners and their varied ideas of illumination. There is a great similarity among average residences. They usually comprise a vestibule, hall, parlor, dining room, library, bed rooms, and other less important rooms. Each of these rooms has accepted types of fixtures, which have been developed in meeting the general requirements and the urgencies of mechanical construction, but in details of design they are unlimited. In the use of candles, oil and gas, the fixtures had to be constructed so as to eliminate as far as possible the chance of burning or damaging the ceilings and walls, which caused the center fixture to be hung as far as possible from the ceiling and the brackets to be extended considerably from the wall. The chandeliers and brackets gradually increased in size until they became the most prominent feature in the room and dwarfed its size. These facts were lamented, but had to be accepted with the means of illumination then available. The question of illumination was left entirely to the owner, who could use as many burners on each fixture as he was willing to pay for and who usually selected the design. Frequently a purchaser would select one design and use it throughout his house, simply varying the number of lights. An exception to this was the hall, where a lantern was invariably used. Others made an exception of parlor, library and dining room. If the ordinary burner furnished with the fixture did not supply him with enough light he experimented with the newest burner that claimed the greatest amount of candle power, with only one thing in mind—to get as much light from one source as possible. The designer was not hampered as to the number of lights he put on a fixture, and could use any number.

The introduction of electricity has changed the conditions previously existing. The danger of fire and smoke is practically eliminated at the light and the designer is given an opportunity to create a lighter and more graceful fixture, gradually doing away with the old type chandelier and developing the present ceiling electrolier. This gives a far more pleasant illumination, as the source is above the normal line of vision and the eye is not offended by the glare of the lamps. It also increases the apparent size of the room and sets off the decorations to a better advantage. When the hanging fixture is necessary for use or decorative purpose, the lights can be better screened and the fixture kept in proportion to the room. This is undoubtedly one of the reasons of the popularity of electric lighting over gas, the gas simply being used for emergency purposes and preferably on the side brackets and in the service portion of the house.

To properly light a residence with electricity, the first and most important principle is to have the wiring properly installed with a full allowance of lights for each outlet, and the outlets carefully located for effective illumination of the entire room and with the light so controlled by switches that the owner can conveniently use as many or as few lights as is desired. The proper allotment of lights at the time of installation is consequently of the utmost importance.

The real problem in residence illumination is to create an efficient illumination without a glare at the source. This cannot be done if the lighting of the room depends upon a few lights of large candle power. It therefore necessitates the use of a number of units of small candle power, and this consideration should be given careful thought by the architect and illuminating engineer when laying out the wiring. It is very difficult to make any change after the residence has been com-

pleted, and poorly designed wiring layout may prevent the fixture designer from securing a satisfactory illumination, as the fixtures have to be supplied with lights within the wiring specifications in order to obtain the underwriters' certificate. The owner is then forced to put up with an insufficient amount of light or to exceed the specified capacity of the wiring by using a larger candle power lamp. This procedure, aside from the risk from violating the rules, will not give a pleasing effect.

Insufficient and misplaced outlets are met with very often and are one of the greatest hindrances to the fixture man in the execution of his part of the work; at the present time the fixtures are the last thing considered. When the question of fixtures is taken up, the house is practically completed, and to make any changes would mean the taking up of floors and often the cutting of walls, to which the owner will rarely agree. I feel that the members of this society can do much to overcome this condition, the main reason for which is the keeping down of the cost; but I feel confident that in nine cases out of ten, if the necessity for more wiring and switches is properly explained to the owner, he will not hesitate at the expense. I cannot recall an instance when he has not blamed the architect or electrician for any shortcomings in this line, and a little insistence at the right time would have saved them censure and given the owner the proper lighting and switching convenience he is entitled to, without the extra cost and annoyance in making changes.

A residence can never be illuminated on the principle solely of so many candle power to a square foot, as there will always be a necessary waste of light in connection with decoration, which depends on the taste of the owner, and this factor should be carefully considered at the time of installation and the owner impressed with its importance.

The present tendency is loward wall brackets. These should be distributed around the room so as to overcome all shadows, permit of a shaded light, and yet give enough illumination to supplement the ceiling fixture in complete illumination. The public is getting more fastidious in regard to the interior of their homes and more particular as to the carrying out of their own ideas, yet they are usually simply guided by the architect, decorator or fixture man. This condition prevents any generalization as to residence fixtures, but the main object should be to have the fixture part of the general scheme of the decoration of the room, and each room should receive its share of attention.

The fixture with the light at an angle has practically been done away with in the better residences on account of the unpleasant effect on the eye, it having been found that a more satisfactory effect is produced with the lights either up or down on both the brackets and ceiling fixtures, as this permits of shading the lamp from the eye by means of decorative shade. Installing a lamp upward on the bracket has proven to be the most practical method for general use, for then with the ordinary open glass shade the lamp is screened from the eye and its light reflected on the ceiling, which adds to the general illumination. In the case of the ceiling fixture, the lamps can be inclosed in a decorative manner when desired.

Recent Patent Issues.

[Prepared by MR. ROYAL E. BURNHAM, Solicitor of Patents and Counsellor in Patent Cases, 833 Bond Building, Washington, D. C., who will furnish illustrations and specifications of any patent mentioned below on receipt of 10 cents.]

835,506. Art of generating gas. C. Ellis, New York; assignor to Combustion Utilities Company, same place.

835,559. Apparatus for gas analysis. E. Schatz, Frankfort-on-the-Main, Germany.

835,626. Gas producer. A. M. Levin, Chicago, Ills.

835,652. Apparatus for lighting and extinguishing lamps. J.W.White, Brighton, Ia.

835,693. Gas stove attachment. W. S. Ward, Philadelphia, Pa., assignor of one-half to S. H. Styles, Washington. D. C.

835,705. Gas lamp. G. E. Hulse, East Orange, N. J., assignor to The Safety Car Heating and Lighting Company.

835,811. Coke drawing machine. S. A. Cooney, New York, and T. J. Mitchell, Connellsville, Pa.

835,847. Gas producer, L. Boutillier, Paris, France.

835,913. Acetylene gas generator. J. F. Ormiston, Colusa, Cal.

835,946. Electric gas lighter. G. Giorgi, Florence, Italy.

836,054. Method of manufacturing gas. P. Schmidt, Hanover, Germany.

836,114. Lighting apparatus. G. E. Hulse, Jersey City, N. J., assignor to the Safety Car Heating and Lighting Company.

836,123. Art of forming mantle supports. C. M. Lungren, Bayonne, N. J., assignor to the Safety Car Heating and Lighting Company.

836,272. Acetylene gas generator. M. F. McNelly, Chicago, Ills.

836,274. Controller for use in connection with the ignition of gas burners. V. C. J. Nightingall, Melbourne, Australia.

836,295. Device for lighting by electricity reversed gas burners. P. Benard, Epernay, France.

836,492. Time gas lighting mechanism. N. F. Englund, Ashland, Wis.

836,495. Gas generator. C. L. Gerrard, Columbus, Neb.

836,500. Process of preparing solutions of gases. H. Howard, North Woburn, Mass.

836,509. Acetylene gas generator. C. A. King, Norwich, N. Y.

836,606. Gas cock. W. N. Pynes, Waterford, N. Y.

836,695. Acetylene generator. G. W. Miller, Osceola, Wis.

836,696. Trap for condensed matter in gas pipes. F. E. Morgan, Brooklyn, N. Y.

836,820. Meter register. L. H. Nash, South Norwalk, Conn., assignor to National Meter Company, New York.

836,826. Apparatus for purifying gases. F. Pettit, Sharpsville, Pa., assignor of one-half to W. A. Barrows, Jr., same place.

836,888. Feeding mechanism for gas producers. L. C. Parker, St. Joseph, Mo.

836,894. Device for connecting gas meters with provers. T. R. Reichelderfer, Newark, N. J.

836,963. Apparatus for generating gas. T. A. Davis, Findlay, Ills.

837,026, Gas producer. C. L. Armstrong, St. Louis, Mo.

837,045. Extraction of ammonia from gas. W. Feld, Honningen-on the-Rhine, Germany.

837,121. Gas producer. Henri Riche, Paris, France.

837,333. Gas lamp. W. S. McLewee, Yardley, Pa.

837,364. Coke leveling machine. G. T. Wickes, Covington, Va., assignor to Covington Machine Company.

837,446. Means for carrying off gases from retorts while being charged. M. Ziegler, Beuerberg, Tsartalbahn, Germany, assignor to Oberbayrische Kokswerke und Fabrikchemischer Produkte Aktien-Gesellschaft, Munich, Germany.

837,471. Gas stove. H. S. Humphrey, Kalamazoo, Mich.

837,571. Gas furnace. B. F. Jackson, Boston, Mass., assignor, by mesne assignments, to F. A. Hawes, same place.

837,584. Gas producer. L. C. Parker, Rochester, N. Y.

837,666. Gas reversing means. A. W. Clausen, South Chicago, Ills.

837,737. Acetylene gas generator. A. E. Schlieder. Buffalo, N. Y., assignor to Monarch Acetylene Gas Company, Omaha, Neb.

837,755. Gas producer. Friedrich Thiele, Hildesheim, Germany.

837,838. Automatic igniting and extinguishing appliance for gas burners. J. Horowitz, Paris, France.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

MR. RICHARD L. SPIERING, Superintendent of the Public Service Company, of St. Cloud, Minn., writing under date of the 13th inst., says that on the day of writing he started up a coal gas plant at St. Cloud. The distribution system consists of 10 miles of main, ranging from 10 inches in diameter to 4-inch. The Company has on its books the names of 200 consumers, and the regular gas service was set for the 20th inst.

MR. A. M. SUTHERLAND, President of the Empire Gas Improvement and Construction Company, announces that the Company has recently finished three contracts amounting in value to $50,000, which contracts were connected with the gas supply of Guelph, Can., Barre, Vt., and Springfield, Vt. The contracts were concerned with extensions of successful works, the growth of the demands thereon being such as to cause the original plants to become too small for their respective communities.

THE Gas and Electric Development Company, of Philadelphia, has sold the gas and electric plants at Trenton, Mo., to Mr. Frank D. Moses, of Trenton, N. J. A new Company has been formed by Mr. Moses and some Philadelphia capitalists, under the title of the Citizens Gas and Electric Company, which is capitalized in the sum of $125,000. A modern Lowe system gas generating set will be installed in place of the present oil gas machine, and the capacity of the electric plant will be doubled. The officers of the new Company are: President, T. F. Fullerson, Trenton, Mo.; Vice-President, Frank D. Moses, Trenton, N. J.; Secretary and Treasurer, W. W. Levering, Philadelphia, Pa.; General Manager, M. A. Maxwell, Easton, Pa.

THE Glens Falls (N. Y.) Gas and Electric Company has assumed control of the properties of the United Gas and Electric Company, which operates in the districts of Sandy Hill, South Glens Falls and Fort Edward.

THE Portland (Me.) Real Estate Taxpayers' Association, at a meeting held there some days ago, passed resolutions vigorously opposing the

recommendation of Mayor Clifford that the city should sell its holdings of 1,700 shares of the capital stock of the local Gas Light Company.

THE proposition to construct and operate a gas plant on municipal account in Crawfordsville, Ga., and to provide a means for raising the money necessary for the construction of such plant, was voted upon some days ago. Result; three-fifths of the votes cast favored the project.

THERE is no doubt whatever about the absorption of the Cleveland Gas Light and Coke Company and the Peoples Gas Light Company, of Cleveland, O., by the A. S. White syndicate, of New York. The change involves no change of moment in the engineering staff of the named Companies.

"W. M. G" is informed that on the 8th inst. articles incorporating the Missoula (Mont.) Gas Company were filed the 8th inst. These specify that the objects of the Company are the manufacturing and supplying of gas for lighting, heating and power purposes to the residents of Missoula and that its offices shall be in Missoula. It is capitalized in the sum of $160,000, and its Directors are George P. Smith, Susan O. Smith, Hezekiah M. Gillett and Fred. C. Finkenstaedt—the latter is a resident of Bay City, Mich.

THE current catalogue of the General Gas Light Company, of Kalamazoo, Mich., is almost as beautiful as the lamp which the Company manufactures in so great a variety of sizes and shapes. Mr. Van Rensselaer Lansingh's attention is called to the merits of the Humphrey gas arc, which for efficiency, economy and completeness is about all that could reasonably be wished for by any user of artificial lighting apparatus.

MR. SYLVESTER J. MCDONOUGH, Superintendent of Construction for the Lockport (N. Y.) Gas and Electric Light Company, is dead at the age of 43. His popularity would seem to be well attested in the fact that the vote once cast for him as Alderman-at-Large for Lockport was the largest ever given to any candidate for office in that city.

MR. ARTHUR L. WOOLLEN has been retained as expert to examine and report upon the condition of the Nashville, Tenn., gas plant, and to make recommendations as to proper course to pursue in the scheme for the rehabilitation or reconstruction of its generating and distributing systems.

THE Lawyers' Title Insurance and Trust Company has been appointed Transfer Agent for the shares of the Peoples Gas Light and Coke Company, of Chicago.

MR. A. L. STOKOE, of New Orleans, is the main one in interest in the the proposal to establish a gas plant at Bay St. Louis, Miss.

MR. TURNER OLIVER has applied for a franchise to construct and operate a gas works in La Grande, Ore.

MR. W. W. HESS, of Allentown, Pa., is proposing to construct a gas works in Emaus, Pa.

IN response to the invitation of the authorities to bid on the new bench work proposed for the bringing up-to-date of the municipal gas plant at Danville, Va., bids were received from 7 different constructors of such work.

THE new offices for the Genesee County Electric Light, Power and Gas Company, of Batavia, N. Y., are to be located in the building formerly occupied as a power house by the old Batavia Gas and Electric Company. The building is to be refitted, ready for occupancy by February 1st.

THE Texarkana (Tex.) Gas and Electric Company has increased its capital stock from $100,000 to $200,000, and has also authorized a bond issue of $100,000, 6 per cents.

AT the annual meeting of the Ottumwa (Ia.) Gas Light Company, no change was made in the executive management.

MR. A. E. KEMPER has resigned the position of Treasurer to the Cruse-Kemper Company, of Philadelphia. The duties of the position have been assigned to Mr. Henry W. Scattergood, who will hereafter act in the capacity of Vice-President and Treasurer to the Company.

THE working staff of the new Business Department of the Union Gas and Electric Company, of Cincinnati, O., are: Managers, E. E. Miller and C. E. Williams; employment agent, A. Houston; division managers, L. Dickson, R. Frazier, G. Ligler, H. C. Chase; sign special, J. Boyle; power special, R. Matser; illuminating specialist, C. Ochlman; industrial gas expert, Wm. Flatt; industrial gas department, E. E. Litz; fuel gas expert, W. Kaschner; advertising agent, W. Boyle.

MR. RICHARD H. DOWNING, for some time a member of the Board of Directors of the Pottsville (Pa.) Gas Company, died at his home in Philadelphia some days ago. He was born in Downingtown, Pa. (which place got its name from his grandfather), February 22d, 1825, and was a much esteemed resident of Philadelphia for upwards of 75 years. Deceased was also a Director in the Westmoreland Gas Coal Company.

MR. WALTER F. WELLS, Manager of the Brooklyn (N. Y.) Edison Illuminating Company, is to be congratulated over the cleverness of the lecture on the steam turbine in an electric lighting plant, that was delivered by him some evenings ago in the lecture room of the Brooklyn Institute of Arts and Sciences. The lecturer tellingly recounted the steps taken in the evolution of the up-to-date power house, and his description of the characteristics of the many steam turbines on the market was terse and lucid. The discourse was copiously illustrated, and it was enjoyed by an audience of numbers.

BIDS for the public lighting of New York City have been invited by the Department of Water Supply, Gas and Electricity. The bids are to be opened the 31st inst., and the eventual contract is to be for 1 year from the 1st prox. The appropriation on lighting account for the year amounts to $3,250,000.

UNDER the careful administration of President Prichard and his competent staff, the fortunes of the Marblehead (Mass.) Gas and Electric Company go on increasing.

MR. FRANK BRUEN, Secretary of the Tampa (Fla.) Gas Company, in the course of an announcement concerning the policy of that well managed corporation, had this to say:

"The Tampa Gas Company wishes to announce to its employees and patrons that on and after January 1, 1907, the Company proposes to place the following plan in operation during the year, and if found practical and satisfactory, to continue it as a feature of the liberal policy of the Company. The rapid growth of Tampa in the past 5 years, and the generous patronage accorded the Gas Company by its citizens, lead this Company to believe that in adopting a plan of mutualizing its business, the very fairest method of managing a public utility can be realized. Our works in this city are the most southerly located in the United States and the greatest distance from the coal and oil fields, on which we depend for raw material in the manufacture of gas. As is well known, the oil in this country is controlled by practically one interest, and some seven-eighths of the anthracite coal is controlled by a few railroad interests. These are absolutely essential constituents in the manufacture of gas. This makes the price of our raw material very uncertain. In fact, during the past year there has been a sharp advance in both of these products.

"Under these conditions we are at a loss to determine at what price we can manufacture gas and deliver it to our customers in the ensuing years. Of all public utilities, gas companies alone are absolutely in the hands of these few interests who furnish raw material for the manufacture of units of heat and light, and who will not make contracts for a period exceeding 12 months.

"Since the cost of manufacturing gas is governed by the price at which these raw materials can be furnished and the amount made and sent out each day, it is the object of the Company to give the employees and patrons a shareholder's interest, thus affording to them any benefits which the Company may secure, either by low markets on coal and oil, or by other economies which may accrue through improved methods of making gas and the general growth of the business. The employees who will participate in a share of the earnings will be those who have displayed the greatest intelligence and energy in gaining results and generally promoting the interests of the Company.

"The private consumers who will participate will be those who are our continuous regular customers who use gas throughout the year. Those transient customers who only use gas for a few weeks or months, and whose business is not usually profitable, will not be included in the mutualization plan. At the end of the year, December 31, 1907, our accounts will be balanced and the net earnings ascertained. The total amount of wages or salary paid during the year to the employees who have earned a right to participate, and all of those bills or our regular private customers which have been paid not later than the 10th of each month will be added together, and the total of these several amounts will be treated the same as the capital of the Company and will participate in the same percentage of its earnings when the dividend is declared. Soon after the end of the year, when the books have been balanced and statements taken off, a dividend check will be sent to each of our employees and customers on the basis stated above. When the gas is consumed in the home, the dividend check will be made payable to the lady of the house. In addition to the above, the Company will reduce the price of gas to our private consumers 10 cents per 1,000 cubic feet, this reduction to become effective after March 1, 1907. The same careful management of the Gas Company's business will obtain in the future as in the past, and reductions in the price of gas will be made from time to time as the growth of the business and other conditions will permit. We, therefore, hope and expect that each of our employees and patrons will, under this plan of sharing in the profits, feel a kindred interest with the stockholders in the increase and development of the business and conservation of our mutual welfare. We trust our friends will appreciate the fact that the Tampa Gas Company is the first Gas Company in the United States to invite both its employees and patrons to participate in its dividends."

THE AMERICAN GAS LIGHT JOURNAL

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NOTIFICATION RESPECTING ADVERTISING.

Orders for new advertising, or for changes in standing advertisements, to insure attention in the issue following their reception, must be in hand any time of Wednesday.

AGENTS:

New York—American News Co., 39 and 41 Chambers St.
Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 30 Lime Street, London.

MONDAY, DECEMBER 24, 1906.

The Market for Gas Securities.

The quotations for Consolidated during the week were well above those recorded for any other week in 3 months past. The buying, too, was undoubtedly of the investment sort. The opening to-day (Friday) was 139 to 140. The retort-house No. 2 of the magnificent plant at Astoria was put into commission last Monday. The Standard Company has passed its dividend for the last term.

Brooklyn Union remains stagnant. Peoples, of Chicago, keeps on advancing, and it looks to us an undoubted purchase. The increase in its output is almost as great relatively as that which marks the business of the Consolidated Company, of New York. Massachusetts Gas Companies is over 61. Keep your eyes on these shares. They are bound to be 25 points higher this time in 1907. Consolidated, of Baltimore, is offered at 90.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

DECEMBER 24.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	139	140
Central Union Gas Co.—				
1st 5's, due 1972, J. & J.	2,000,000	1,000	101	104
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	..	106
Mutual	3,500,000	100	190	225
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	98½	100
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	37	43
1st Mtg. Gold Bds. 5 p.ct.	1,000,000	..	98	104
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	,000	101	103
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	108	111
Con. 5's, due 1945, J. & J.	1,500,000	..	104	110
Standard	5,000,000	100	140	160
Preferred	5,000,000	100	155	175
1st Mtg. 5's, due 1930, M. & N	1,500,000	1,000	104	108
The Brooklyn Union	15,000,000	1,000	108	116
1st Con. 5's, due 1948, M. & N	15,000,000		107	..
Yonkers	299,650	500	130	..
Out-of-Town Companies.				
Bay State	50,000,000	50	5/16	¾
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	..	65
" 1st Mtg. 5's	509,000	1,000	95	100
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	9	10
" " Bonds, 5's	5,230,000	1,000	75	80
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	106¾
Cincinnati Gas and Electric Co.	29,500,000	100	99¼	100
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	90	..
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	..	95
Preferred	3,026,500	100	107¼	108
Consumers, Toronto	2,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	80	90
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N. J.	1,000,000	100	15	17
Con. Mtg. 5's	880,000	1,000	92	95
Bonds	75,000	..	..	100
Detroit City Gas Co	5,000,000	50	..	50
" Prior Lien 5's	4,613,000	1,000	..	98
Detroit Gas Co., 5's	381,000	1,000	75	80
" Inc. 5's	16,000	100	98½	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	39	40
Fort Wayne	2,000,000	..	..	..
" Bonds	2,000,000	..	55	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	..	110	112
" Bonds, 5's	10,500,000	..	107½	108½
Indianapolis	2,000,000	..	60	70
" Bonds, 5's	2,650,000	..	104½	105
Jackson Gas Co	250,000	50	82	..
" 1st Mtg. 5's	290,000	1,000	97	100
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	35
Bonds, 1st 5's	3,322,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	..	05
Preferred	2,500,000	100	95	110
Bonds	10,000,000	1,000	104	104½
Lafayette Gas Co., Ind.	1,000,000	100	..	80
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	143	145
Madison Gas & Elec. Co.				
" 1st Mtg. 6's	350,000	1,000	108	108¾
" 6 per cent. scrip, due 1910	100,000	25	85	87
Massachusetts Gas Companies of Boston	25,000,000	100	61½	62½
Preferred	25,000,000	100	84¾	85¼
Montreal, Canada	2,000,000	100	218	218¾
Nashville Gas Lt. Co.	1,000,000	100	110	..
Newark, N. J., Con. Gas Co.	6,000,000	..	56	58
Bonds, 6's	6,000,000	..	137	138
New Haven	2,000,000	25	200	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	96⅞	96½
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	30,100,000	1,000	..	..
" 2d "	2,500,000	1,000	104	..
Rochester Gas & Elec. Co.	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	104½	105¼
San Francisco, Cal.	15,800,000	100	..	..
St. Joseph Gas Co. 1st Mtg. 5's	751,000	1,000	92	..
St. Paul Gas Light Co	1,500,000	100	45	47
1st Mortgage 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	2,465,000	1,000	96¼	..
Syracuse, N. Y.	1,975,000	100	50	55
Bonds	2,047,000	1,000	102	..
Washington, D. C	2,600,000	20	294	295
First mortgage 6's	600,000	..	..	..
Western, Milwaukee	4,000,000	..	..	..
Wilmington, Del.	600,000	50	220	..

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DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO.,
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PHILADELPHIA, PA., Dec. 12, 1906.

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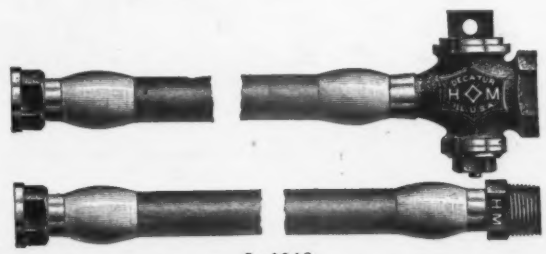

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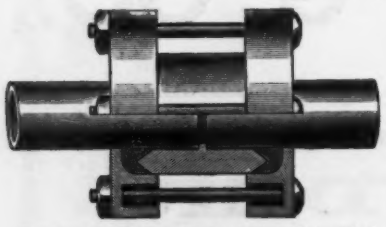

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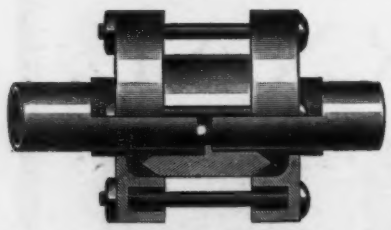

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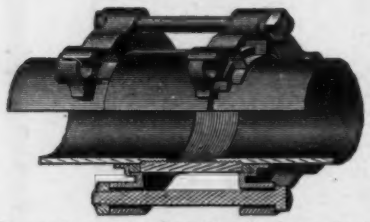

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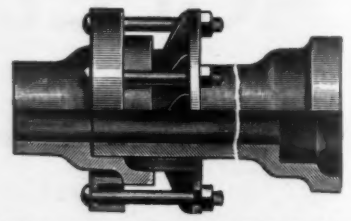

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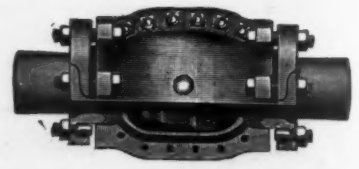

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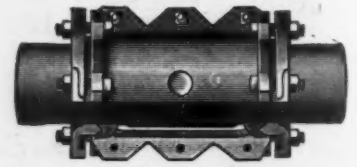

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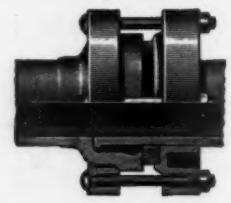

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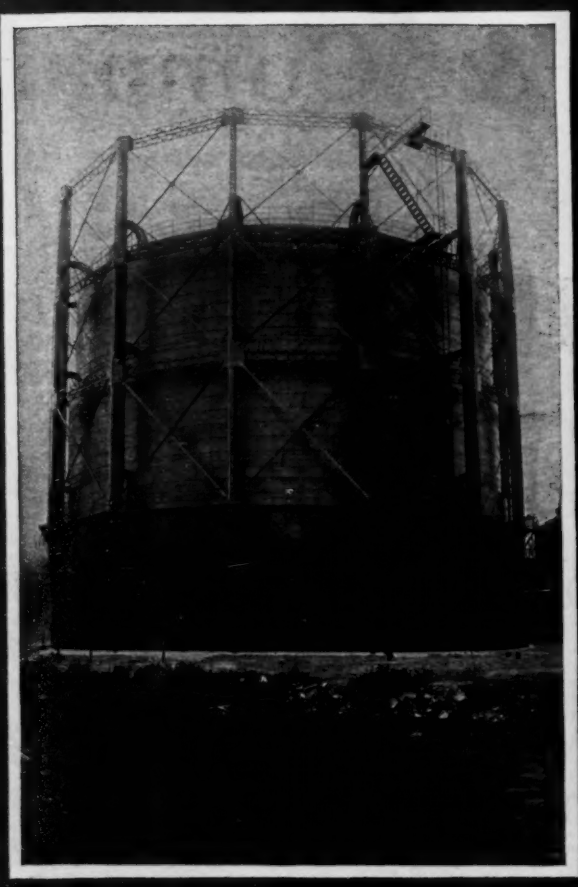

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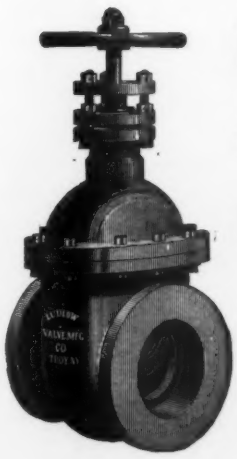

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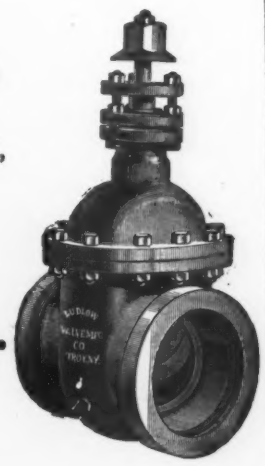

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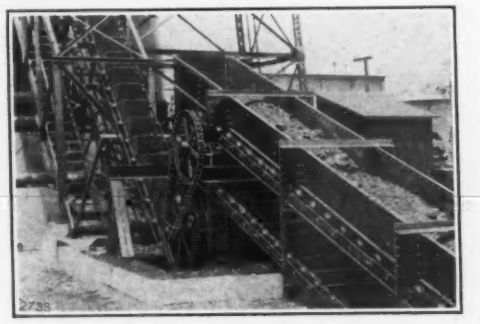

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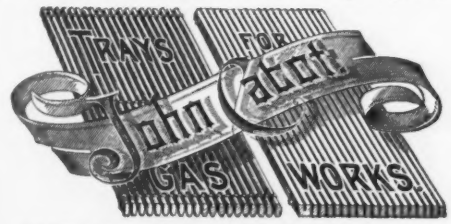

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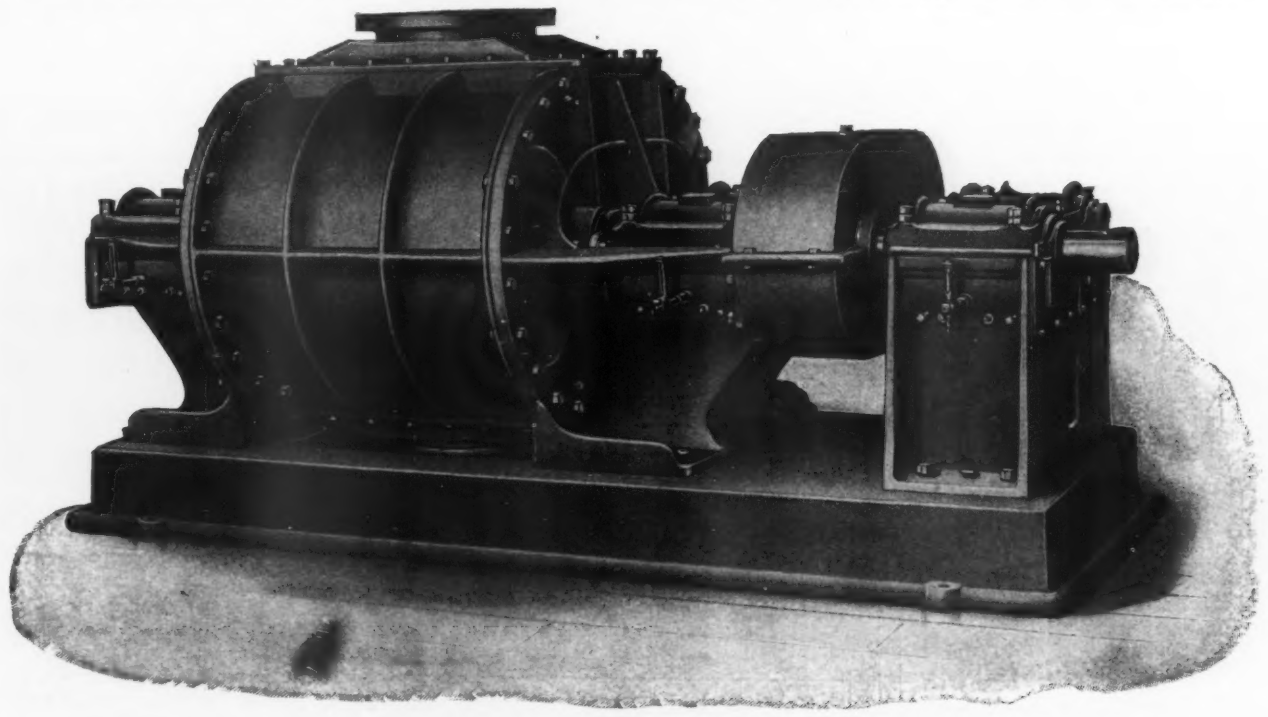

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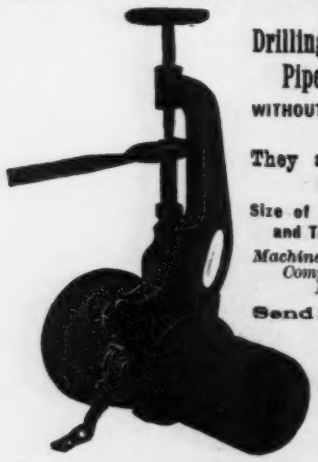

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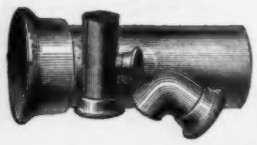

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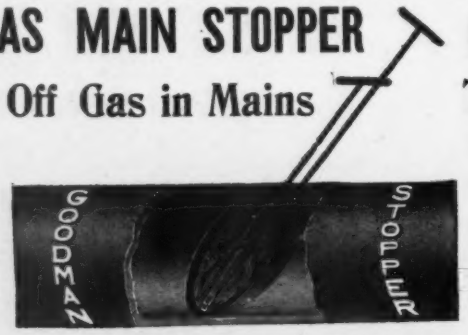

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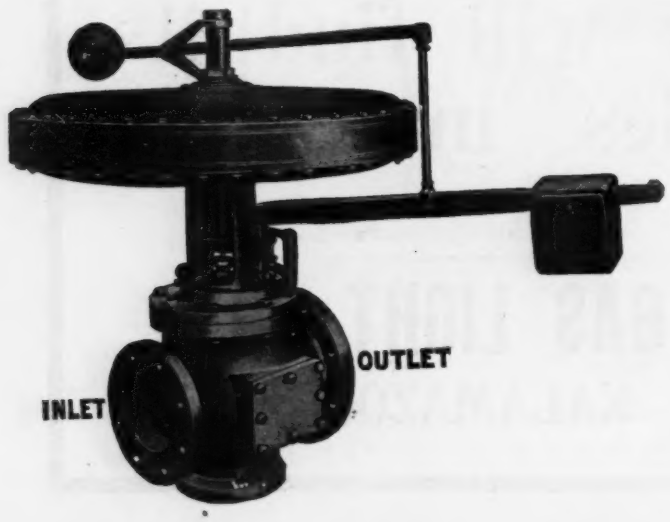

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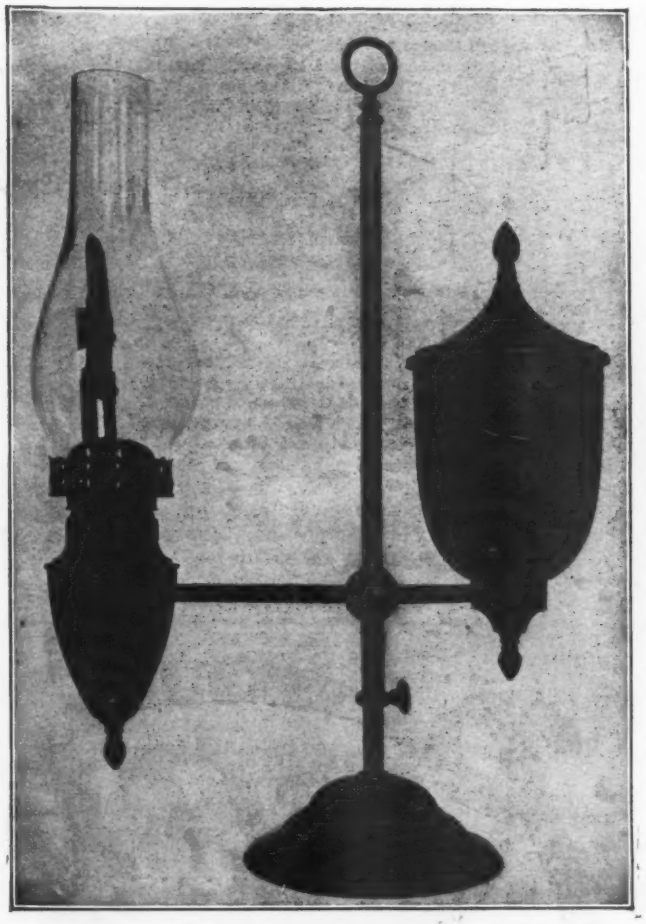
Day of Week.	Date.	Table No. 1. FOLLOWING THE MOON. Light.	Extinguish.
Tue.	1	5.20 PM	7.40 PM
Wed.	2	5.20	8.30
Thu.	3	5.20	9.30
Fri.	4	5.20	10.30
Sat.	5	5.20	11.40
Sun.	6	5.20	12.40 AM
Mon.	7	5.20 LQ	1.50
Tue.	8	5.20	3.00
Wed.	9	5.20	4.10
Thu.	10	5.20	6.20
Fri.	11	5.20	6.20
Sat.	12	5.20	6.20
Sun.	13	5.30 NM	6.20
Mon.	14	5.30	6.20
Tue.	15	5.30	6.20
Wed.	16	5.30	6.20
Thu.	17	5.30	6.20
Fri.	18	9.10	6.20
Sat.	19	10.10	6.20
Sun.	20	11.10 FQ	6.20
Mon.	21	12.10 AM	6.20
Tue.	22	1.10	6.20
Wed.	23	2.10	6.20
Thu.	24	3.00	6.20
Fri.	25	4.00	6.20
Sat.	26	4.50	6.20
Sun.	27	5.30	6.10
Mon.	28	No L.	No L.
Tue.	29	No L FM	No L.
Wed.	30	No L.	No L.
Thu.	31	5.50 PM	8.30 PM

TOTAL HOURS DURING 1907.

By Table No. 1.

	Hrs.Min.
January	211.10
February	193.40
March	182.10
April	167.00
May	157.00
June	145.30
July	151.50
August	162.30
September	175.30
October	202.40
November	209.30
December	231.50
Total, yr.	2190.20



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***

10-Candle Power.

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This lamp is a perfect substitute for the 10-candle Pentane Lamp hitherto used, and has the following advantages:

1st. It uses Standard Kerosene Oil (Pratt's Astral Oil or equivalent).

2d. It is remarkably steady. Will burn 24 hours continuously with less than 2 per cent. variation.

3d. It is much less dangerous than Pentane, which is a kind of gasolene.

4th. It is not easily affected by air currents in the photometer room.

5th. Since the lamp may burn continuously, the candle power of gas may be taken at any moment, if necessary. This insures steady illuminating power without waste of carburetting material.

6th. The first cost of the lamp brings it within the reach of even small gas works.

7th. Costs much less to maintain than a Pentane lamp or sperm candles doing the same service.

8th. Is not affected by the weather.

PUBLIC LIGHTING TABLE.

JANUARY, 1907.

Day of Week.	Date.	Table No. 2. NEW YORK CITY. All Night Lighting. Light	Extinguish.
		P. M.	A.M.
Tue.	1	4.30	6.30
Wed.	2	4.30	6.30
Thu.	3	4.30	6.30
Fri.	4	4.30	6.20
Sat.	5	4.30	6.30
Sun.	6	4.30	6.30
Mon.	7	4.30	6.30
Tue.	8	4.40	6.30
Wed.	9	4.40	6.30
Thu.	10	4.40	6.30
Fri.	11	4.40	6.30
Sat.	12	4.40	6.30
Sun.	13	4.40	6.30
Mon.	14	4.40	6.30
Tue.	15	4.50	6.25
Wed.	16	4.50	6.25
Thu.	17	4.50	6.25
Fri.	18	4.50	6.25
Sat.	19	4.50	6.25
Sun.	20	4.50	6.25
Mon.	21	4.50	6.25
Tue.	22	5.00	6.25
Wed.	23	5.00	6.25
Thu.	24	5.00	6.25
Fri.	25	5.00	6.25
Sat.	26	5.00	6.25
Sun.	27	5.00	6.25
Mon.	28	5.00	6.25
Tue.	29	5.05	6.15
Wed.	30	5.05	6.15
Thu.	31	5.05	6.15

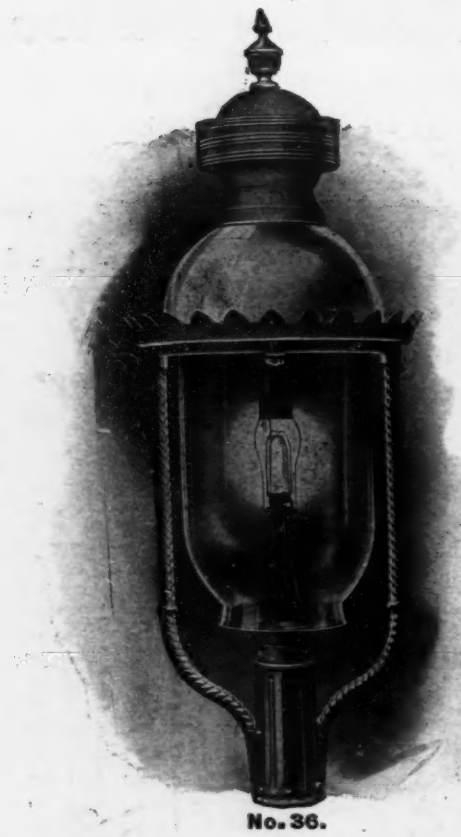
TOTAL HOURS DURING 1907.

By Table No. 2.

	Hrs.Min.
January	423.20
February	355.25
March	355.35
April	298.50
May	264.50
June	234.25
July	243.45
August	280.25
September	321.15
October	374.30
November	401.40
December	433.45
Total, yr.	3987.45

NEW YORK, 318 West 42d Street.
BOSTON, 820 Beacon Building.
PHILADELPHIA, Broad and Arch Streets.
ST. LOUIS, 712 Roe Building.
CHICAGO, 218 La Salle Street.
SAN FRANCISCO, 512 Oak Street.

WELSBACH STREET LIGHTING COMPANY



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Will Not Flash Back.
Will Not Blacken Mantles.
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Rich Mellow Light.

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Kirksville, Mo.	**Manchester, N. H.**	**New York,** Cent. Un. (3d contract).
St. Johnsbury, Vt.	**Allentown, Pa.**	**Jefferson City, Mo.**
Memphis, Tenn. (2d contract).	**Omaha, Neb.**	**Peekskill, N. Y.** (2d contract).
Council Bluffs, Ia. (2d contract).	**Muskegon, Mich.**	**Waterville, Me.**
Seattle, Wash. (2d contract).	**Nazareth, Pa.** (2d contract).	**Washington, D. C.** (3d contract).

TOTAL SETS TO JULY 1, 1906, - - - - - 618

TOTAL DAILY CAPACITY TO JULY 1, 1906, 488,930,000 CUBIC FEET.

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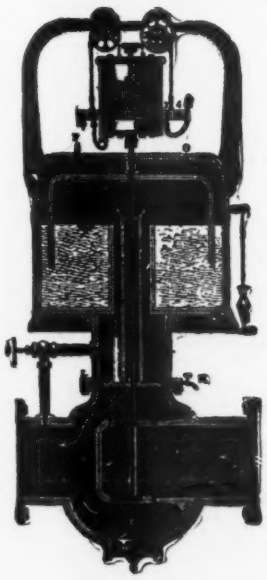

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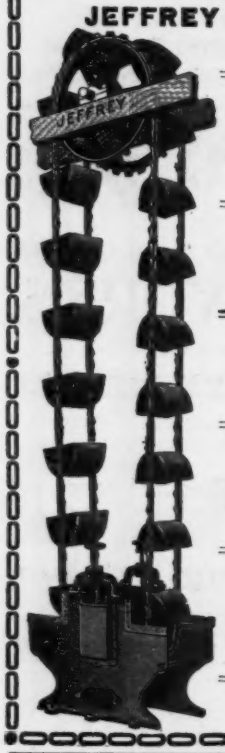

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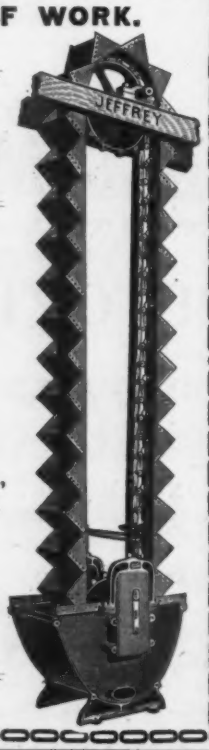

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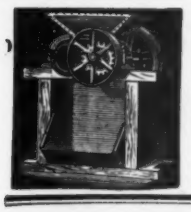

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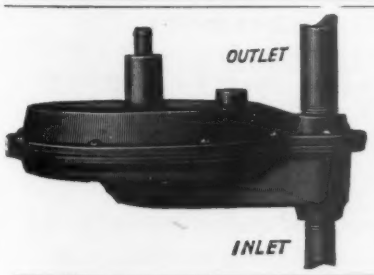

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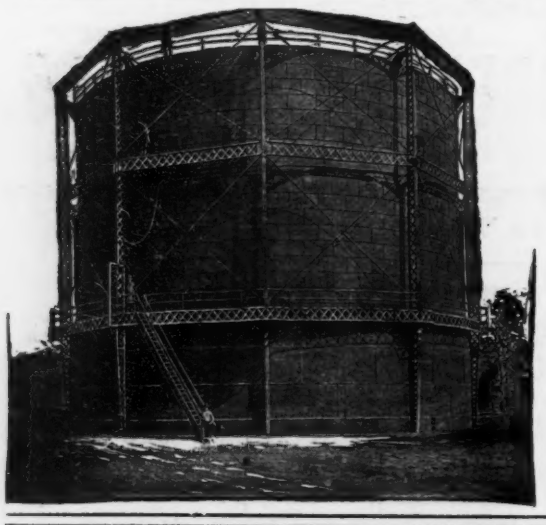

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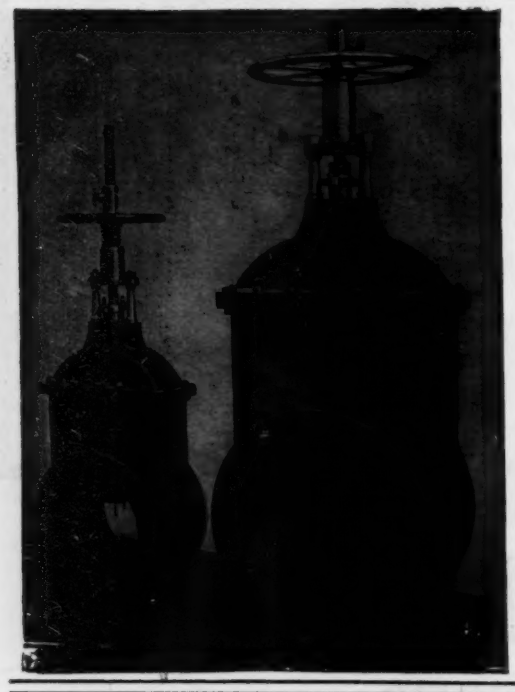

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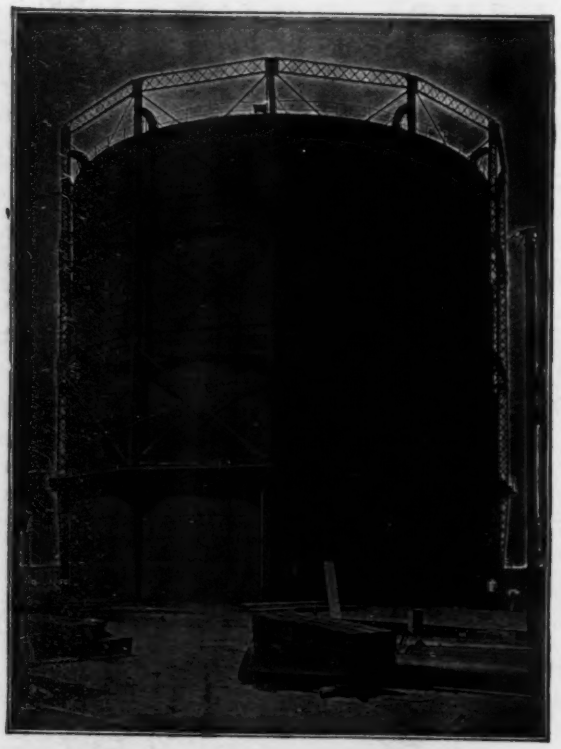

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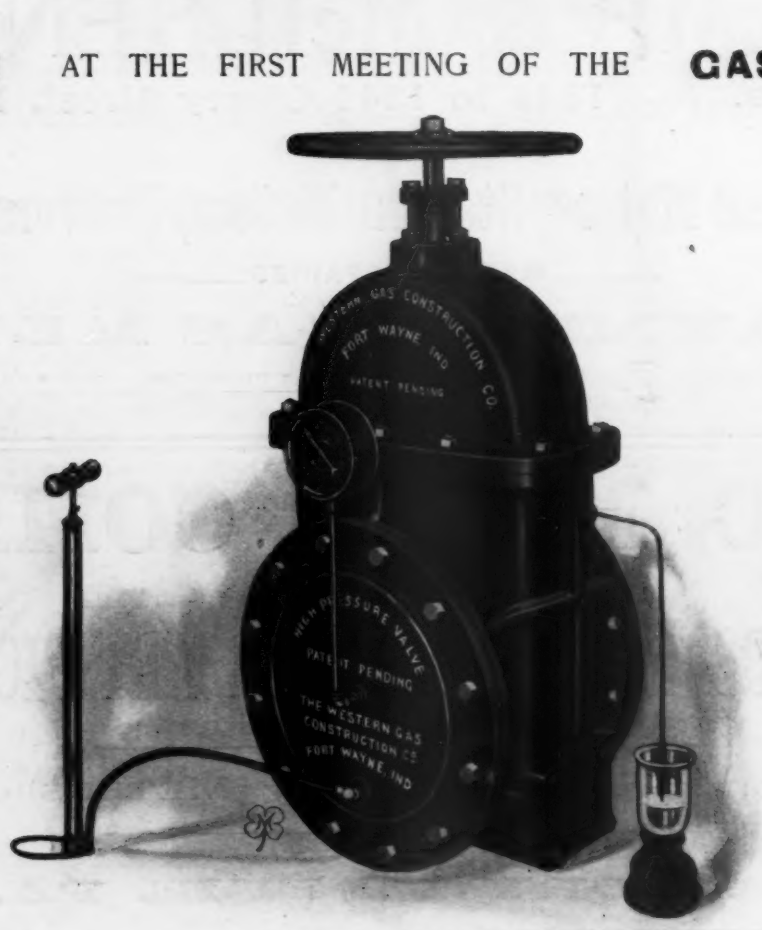

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